# ANALYSIS OF USER REQUIREMENTS OF OFFICE PRODUCTS

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OCTOBER 1983

# ANALYSIS OF USER REQUIREMENTS OF OFFICE PRODUCTS

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## EXHIBITS

# 1 INTRODUCTION

# I INTRODUCTION

- This report on user requirements for office products is produced by INPUT as part of the 1983 Field Service Program for the United States, for clients of that program.

- The principal driving force behind field service management decisions on packaging and pricing maintenance services (both hardware and software) should be users' requirements for such services and their levels of satisfaction with current services.

- New issues, such as using field engineers in sales roles and customer involvement in the maintenance process, should also be critically reviewed in light of users' opinions.

- For this reason, INPUT has scheduled the user requirements series as the first deliverables of the 1983 Field Service Program.

- Each report concentrates on one area of the market. This report is addressed to the office product user. Each product type is treated separately so that vendors may make comparisons with competitors within their product type.

## A. DEMOGRAPHICS

- A total of 306 telephone interviews with users were accomplished as indicated in Exhibit I-1 (by product type) and Exhibit I-2 (by industry sector). The titles of those interviewed were as follows:

| | |
|---|---|
| President/Vice-President/Owner | 32 |
| Data Processing Manager | 75 |
| Office Services Manager | 40 |
| Telecommunications Manager | 33 |
| Word Processing Manager | 37 |
| Purchasing Manager | 18 |
| Other | 70 |
| | 305 |

## B. METHODOLOGY

- The basis for the interview program was the questionnaire shown in Appendix A. The data obtained was entered on dBASE II's relational data base management system and analyzed using ABSTAT. The resulting raw data were summarized to produce the exhibits that are part of this report, and copies of the printouts themselves were sent to each client for more detailed analysis.

## C. USERS INTERVIEWED

- Individual users' identities are confidential. Their anonymous responses have been provided to clients in the form of raw data printouts, however, and the list of companies interviewed, without the associated responses, are provided in Appendix C.

EXHIBIT I-1

INTERVIEW SAMPLE BY PRODUCT TYPE

| PRODUCT TYPE | USERS INTERVIEWED | MAIN VENDORS SURVEYED |
|---|---|---|
| Copiers | 51 | IBM, Kodak, Savin, Xerox |
| Facsimile Machines | 32 | Burroughs, Panafax, Telautograph, 3M |
| PBX, PABX | 29 | AT&T, GTE, Rolm |
| Personal Computers | 61 | Apple, Hewlett-Packard, IBM, Osborne |
| Word Processors | 70 | CPT, IBM, NBI, Wang, Xerox |
| Workstations | 62 | Burroughs, Hewlett-Packard, NCR, Univac, Wang |
| Total | 305 | |

EXHIBIT I-2

## OFFICE PRODUCTS USER SAMPLE BY INDUSTRY SECTOR

| SECTOR | USER INTERVIEWS |
|---|---|
| Process Manufacturing | 31 |
| Discrete Manufacturing | 34 |
| Transportation | 6 |
| Utilities | 3 |
| Banking and Finance | 30 |
| Insurance | 42 |
| Medical | 11 |
| Education | 8 |
| Retail | 15 |
| Wholesale | 20 |
| Federal Government | 8 |
| State and Local Government | 29 |
| Services | 59 |
| Other | 10 |
| Total | 305 |

- Compared to the large system, small system, and peripheral/terminal users, office product users know less about field service issues and terminology. Nevertheless, they have the same needs as other customers for both principal services (such as hardware maintenance, software maintenance, relocation/deinstallations, and sales) and ancillary services (such as environmental planning, consulting, documentation, and training). As office products become more sophisticated and functionally integrated into the total information systems, users will require better service from their vendors.

# II EXECUTIVE SUMMARY

# II EXECUTIVE SUMMARY

## A. TOTAL SERVICE CONCEPT

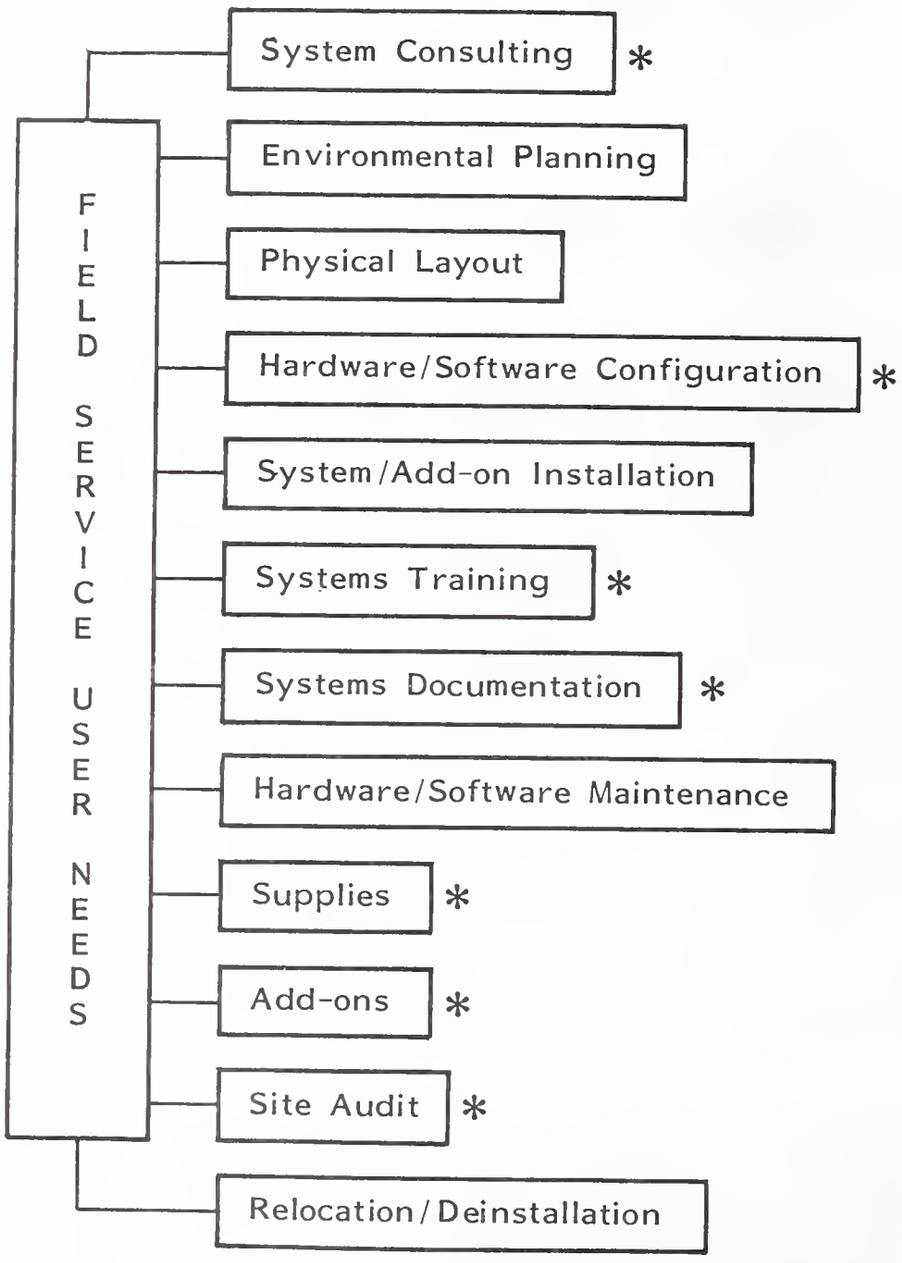
- Introduced in the Large-scale System User Requirements report, the total service concept refers to the growing trend toward integration of all facets of hardware and software service. This effort emphasizes both principal service activities, such as hardware and software maintenance, relocations/deinstallations, site audits, and add-on and supplies sales, and ancillary services, such as environmental, installation, and physical site planning, consulting, training, and user documentation. These components are schematically shown in Exhibit II-1.

- Although large-system users receive many of these services, office product users also need them, especially as they and the products they use become more sophisticated. Users are especially interested in more after-sales support activities.

- Users like this combination of traditional maintenance and sales activities because it increases their contact with field service (FS) personnel. In many cases, it fosters a greater feeling of trust in the field service representatives' recommendations. These maintenance and sales activities can be combined into a role of after-sales support (as exemplified by the many FS organizations that call themselves customer services).

EXHIBIT II-1

COMPONENTS OF FIELD SERVICE




* Usually not part of today's field service.

## B. AFTER-SALES SUPPORT COMPONENTS

- Exhibit II-1 lists 12 components of field service that satisfy the needs and requirements of the office product user:

  - System consulting: an after-sales activity that aims at integrating site configuration growth with user application implementation plans. Field engineers usually have the status of a system consultant in the eyes of the user; this activity merely sanctions that status on a fee-paying basis.

  - Environmental planning: monitors the quality of the environment of the locations in which equipment is installed.

  - Physical layout: normally a (free) part of service activities.

  - Hardware/software configuration: usually accomplished initially (and inconsistently) by the sales and sales support staff, with the main preoccupation being to minimize sales price. The ongoing development of the configuration, particularly with a view to the hardware implications of software additions, is a service best rendered by field services.

  - System and add-on installation: already a part of field service.

  - Systems training: ongoing training in hardware and software use (as opposed to the initial training provided by sales support). In particular, ongoing software training should aim at reducing the 60% of maintenance calls that are caused by misuse or lack of understanding.

  - Systems documentation: both hardware and software. An integral part of systems training, and vitally important to office products users.

- Hardware/software maintenance: the core business of all field service organizations.

- Supplies: still frequently excluded from field service operations.

- Add-ons: still the domain of sales, mainly because sales representatives view this as a captive source of revenue for commission generation.

- Site audit: frequently absent from the list of vendor services, despite the excellent side benefits in customer satisfaction, service image, and field data gathering.

- Relocation/deinstallation: usually part of field services.

- Although some of these services may not apply to specific product types, the overall coordination of service and sales activities is essential to all office products types.

## C. REQUIREMENTS VERSUS CURRENT SERVICE

- Most field service operations still measure their performance solely by response time, repair time, and system availability. While these measurements do supply vendors with tangible indications of their performance, they do not communicate user dissatisfaction with all aspects of maintenance.

- For example, users report that both response time and system availability exceed requirements, yet feel that overall hardware service is lower than required. This reflects two salient points:

- User satisfaction with hardware maintenance cannot be measured solely by response time, repair time, and system availability, but by the successful integration of all previously defined after-sales components.

- Vendor focus is misdirected, as some users receive a much higher level of service than required (overkill) while others receive lower than required levels.

- The term "overkill" is not necessarily a negative. It merely shows areas where resources can be effectively redirected. Some of these areas of overkill, such as consulting, may be intentional. Only the vendor can determine the definition of ideal allocation. INPUT defines ideal as less than 20% overkill, more than 50% satisfied, and less than 30% dissatisfied.

- These two points identify a major goal of field service organization: to correctly measure the needs of each user in order to invest the right amount of time and labor to satisfy those needs without waste.

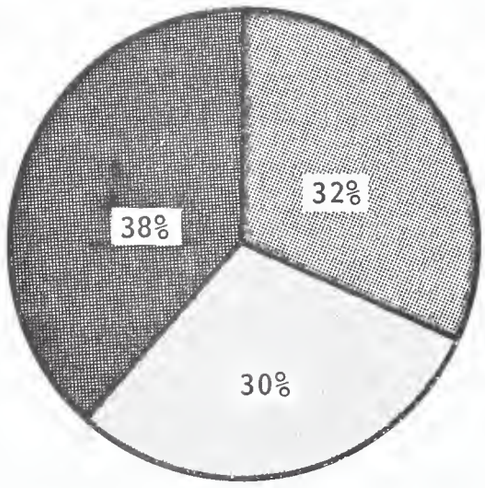
- Exhibit II-2 summarizes users requirements for principal after-sales support services, while Exhibit II-3 summarizes user requirements for ancillary services. Exhibit II-2 indicates that users require improvements in hardware maintenance and software maintenance (two principal services). Exhibit II-3 demonstrates a need for improvements in documentation, while showing user satisfaction with training and installation planning.

## D. USER RATINGS OF VENDORS

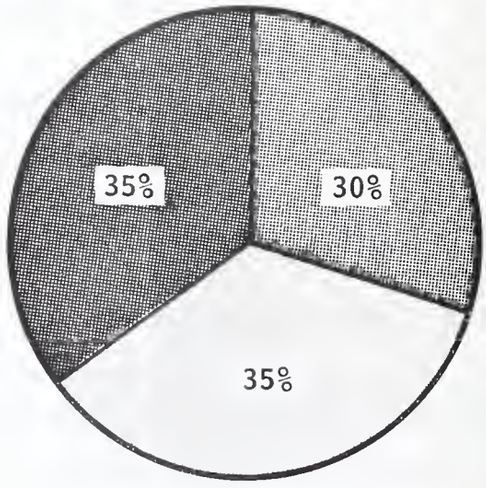
- Users' ratings of large-system vendors vary greatly from one product type to another, as shown by Exhibit II-4. This chart does not compare one product type to another, rather it shows how users are rating the satisfaction of their requirements within each product type.

EXHIBIT II-2

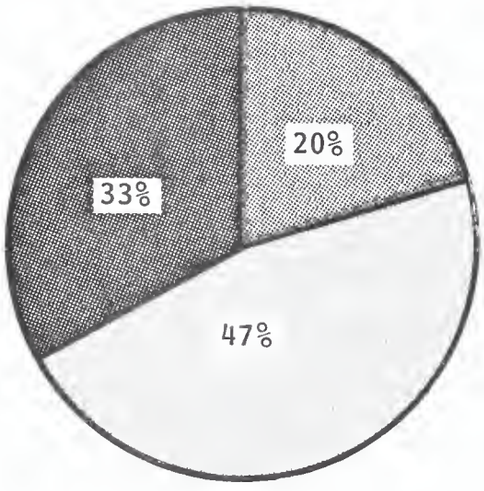
USER REQUIREMENTS VERSUS SERVICE RECEIVED
(Principal Services)



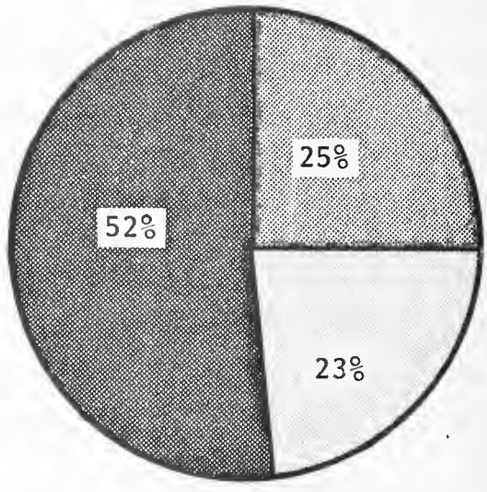

Hardware Maintenance



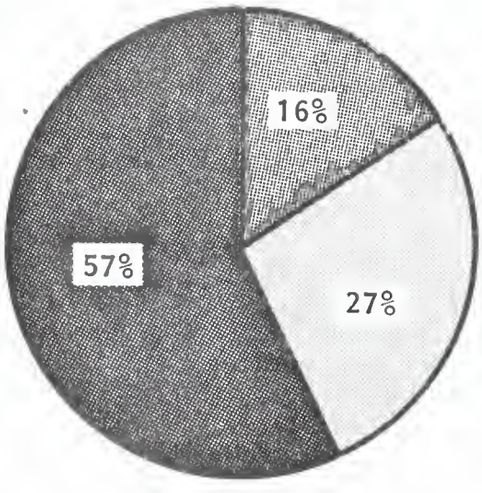

Software Maintenance



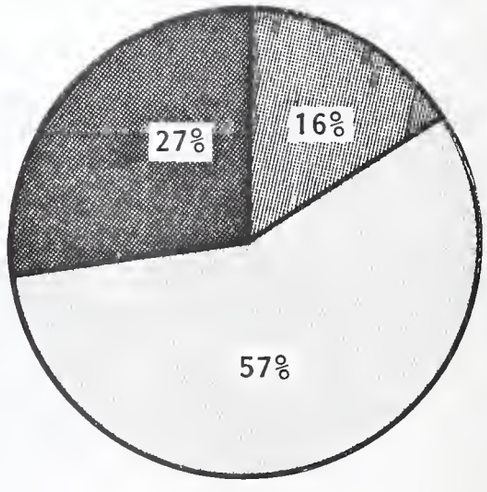

Relocation/Deinstallation




Add-on Sales




Supplies Sales

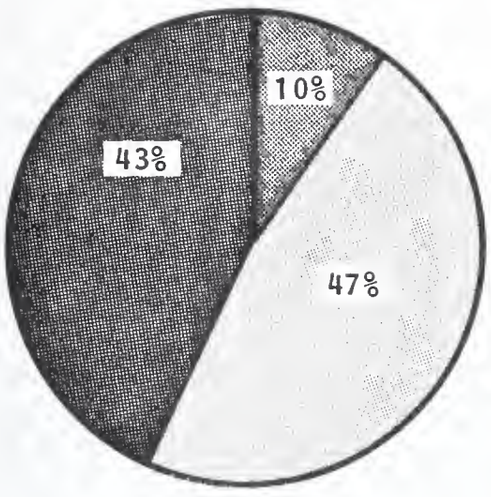



Site Audit

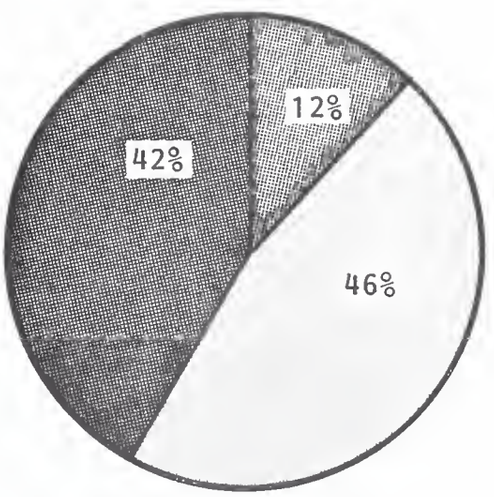
Satisfied  Dissatisfied  Overkill

EXHIBIT II-3

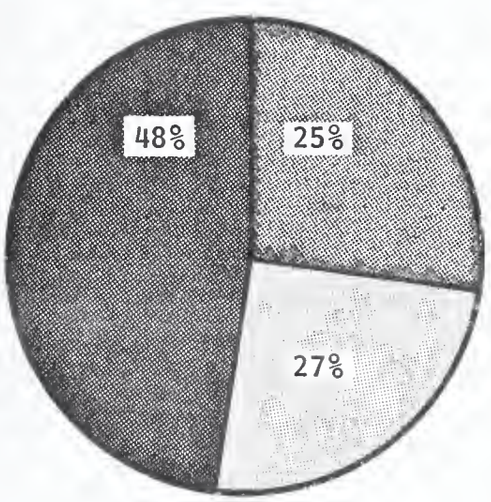
USER REQUIREMENTS VERSUS SERVICE RECEIVED
(Ancillary Services)



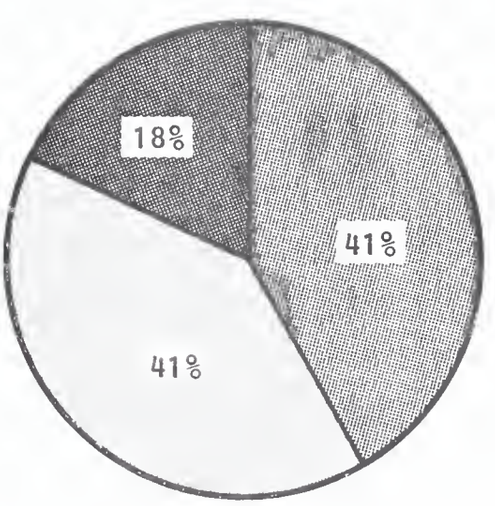

Environmental Planning



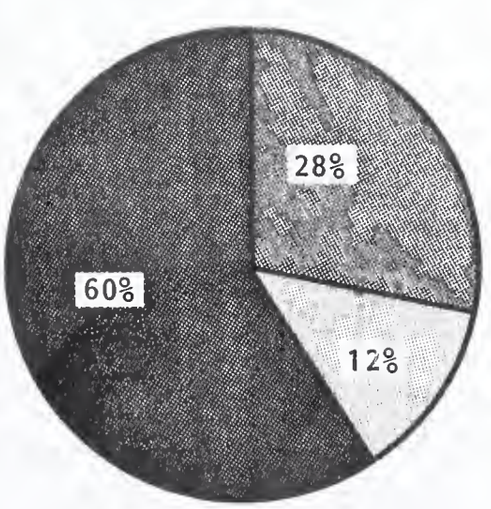

Physical Site Planning



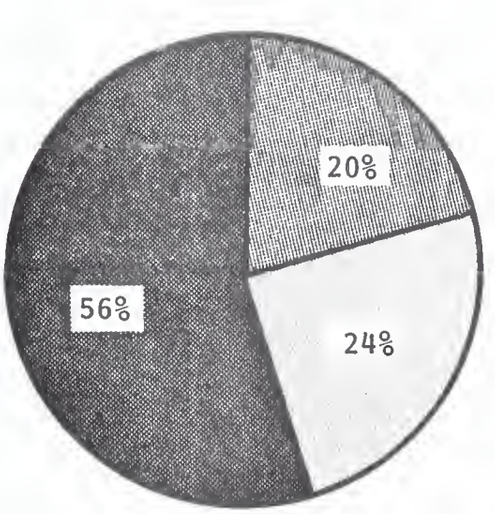

Consulting Services




User Documentation




Training




Installation Planning

Satisfied  Dissatisfied  Overkill

EXHIBIT II-4

OVERALL USER RATINGS OF LARGE-SYSTEM VENDORS

| VENDOR | USER RATINGS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Environmental Planning | Physical Site Planning | Consulting | Documentation | Training | Installation Planning | Hardware Maintenance | Software Maintenance | Supplies Sales | Add-on Sales | Site Audits | Relocation | Deinstallation | Total Score (A = 3, B = 2, C = 1) |
| Copiers | B | A | A | C | C | A | – | * | B | A | – | A | B | 23 |
| Facsimile Machines | – | – | A | – | B | B | – | * | – | C | – | – | – | 8 |
| PBX, PABX | A | A | B | B | B | A | C | – | B | B | C | C | – | 20 |
| Personal Computers | – | – | – | – | – | – | – | – | B | * | * | * | * | 2 |
| Word Processors | B | C | B | – | C | A | C | C | B | C | C | C | B | 18 |
| Workstations | A | B | B | C | A | – | – | B | A | – | – | C | – | 17 |
| Overall Service Scores | 10 | 9 | 12 | 4 | 9 | 11 | 2 | 3 | 11 | 7 | 2 | 6 | 4 | |

A = 25% or less dissatisfied, and at least 50% satisfied
B = 35% or less dissatisfied, and at least 40% satisfied
C = 45% or less dissatisfied, and at least 30% satisfied

– = all grades below A, B, and C

- Three dramatic insufficiencies are brought to light by the exhibit:

  - The level of hardware maintenance (and to a lesser degree software maintenance, where applicable) is substantially below user requirements, highlighted by the fact that only two of the six product types received a rating as high as "C."

  - Documentation is also rated below user requirements, with only PBX/PABX users receiving "B" service, and facsimile machine and personal computer users receiving less than "C" service.

  - Perhaps most dramatic is the overall poor showing of personal computer service, which received less than "C" levels of service in all areas except sales of supplies. This is mainly because the principal distribution channels for the personal computer are retail stores, which have little or no ability in areas such as environmental, physical site , consulting, training, and installation planning, and have little incentive to sell maintenance contracts for hardware or software.

- The ratings in Exhibit II-4 point out areas where vendors can improve overall user satisfaction, leading to improved service image and increased revenue opportunities.

# III AFTER-SALES SUPPORT REQUIREMENTS

# III AFTER-SALES SUPPORT REQUIREMENTS

## A. INTRODUCTION

- This section deals with the user requirements of the installed base of top vendors in each product type. Their users are broken up into three categories:

  - The first category is made up of those who require less than the average level of provided service (overkill) in a particular area (e.g., installation planning), plus those who require service that is equal to or greater than average.

  - Those requiring equal to or greater than average levels of service are then divided into two categories:

    . Those who are satisfied with the service they receive (satisfied).

    . Those who are not (dissatisfied).

- Each chart also provides an overall measure (on a scale of 1 through 10) of the average level of service required for a given type of service and the overall level of service received. This indicates those areas of service that require attention.

- The following analyses are based upon the users' level of service received versus the level that they require, within each product type. This does not allow direct comparison of service ratings between different product types. What the analyses do show are the areas within each product type that are strengths and weaknesses as perceived by users.

- The charts should be interpreted bearing in mind the following points:

  - Cases where there are high percentages of overkill and dissatisfaction indicate an obvious need to redirect service efforts: some users get more attention than they need, while others get less.

  - A realistic goal for vendors should be delivering service with less than 20% overkill, more than 50% satisfied, and less than 30% dissatisfied.

- Office product users have a wider range of service requirements than other systems. For example, some product types, such as copiers and facsimile machines, require no software service, while others, e.g., personal computers, require little or no service in the areas of site audits, relocations, and deinstallations. This further shows that analysis of user ratings should be confined to each product type.

- Furthermore, because office products users are less sophisticated, a greater emphasis should be placed upon consulting, training, and documentation.

## B. COPIER USERS' REQUIREMENTS

- The copier user sample interviewed was comprised of IBM, Xerox, Kodak, and Savin users. Exhibit III-1 provides full details of responses.

EXHIBIT III-1

USER REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
PRODUCT: COPIERS

| TYPE OF SERVICE PROVIDED | AVERAGE LEVEL OF SERVICE | | PERCENT OF USERS REQUIRING | | |
|---|---|---|---|---|---|
| | REQUIRED | RECEIVED | Less than Average Level of Service Provided (OVERKILL) | Equal to or Greater than Average Level of Service, and Get It (SATISFIED) | Equal to or Greater than Average Level of Service, and Receive Less (DISSATISFIED) |
| Environmental Planning | 4.15 | 5.05 | 45.0% | 45.0% | 10.0% |
| Physical Site Planning | 3.75 | 5.00 | 45.0 | 55.0 | 0.0 |
| Consulting | 4.87 | 5.71 | 32.3 | 58.0 | 9.7 |
| Documentation | 6.33 | 6.73 | 37.8 | 31.1 | 31.1 |
| Training | 6.13 | 6.75 | 35.0 | 47.5 | 17.5 |
| Installation Planning | 5.21 | 5.54 | 33.3 | 54.2 | 12.5 |
| Hardware Maintenance | 8.02 | 8.25 | 23.5 | 31.4 | 45.1 |
| Software Maintenance | N/A | N/A | N/A | N/A | N/A |
| Supplies Sales | 6.98 | 7.70 | 34.9 | 44.2 | 20.9 |
| Add-on Sales | 5.86 | 5.55 | 22.7 | 54.6 | 22.7 |
| Site Audits | 2.46 | 2.15 | 69.2 | 23.1 | 7.7 |
| Relocation | 4.89 | 5.42 | 31.6 | 52.6 | 15.8 |
| Deinstallation | 4.50 | 4.32 | 40.9 | 40.9 | 18.2 |

Rating: 1 = Low, 10 = High

= Area Requiring Improvement

- Copier users reported the highest overall service level of all the office product types, with satisfaction levels in most areas above 45% in seven of the twelve possible areas, and satisfaction levels above 50% in five areas.

- Furthermore, copier users rated the crucial areas of consulting and training relatively high (58% satisfied and 47.5% satisfied respectively).

- An area requiring immediate attention is hardware maintenance, which received a dissatisfaction rating of 45%. This is a common weakness with all office product vendors.

- Site audits is a service requiring a redirection of focus, as demonstrated by an extremely high overkill rating of just under 70%. Vendors should be able to better direct their resources in this area in order to increase the overall satisfaction level of this service.

- Even though the areas of environmental and physical site planning have relatively high overkill ratings of 45%, their satisfaction levels are also comparatively high, thus requiring less attention.

- User documentation requires some attention in order to raise its overall satisfaction versus dissatisfaction levels. As it stands now, the same number of users are dissatisfied with their documentation as are satisfied.

## C. FACSIMILE MACHINE USERS' REQUIREMENTS

- Facsimile machine users interviewed were predominantly from 3M, Burroughs, Panafax, and Xerox. Exhibit III-2 provides full details of responses.

- Four areas requiring immediate attention are relocations and deinstallations, which have high levels of overkill and low satisfaction levels, and environ-

EXHIBIT III-2

## USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED

PRODUCT: FACSIMILE MACHINE

| TYPE OF SERVICE PROVIDED | AVERAGE LEVEL OF SERVICE | | PERCENT OF USERS REQUIRING | | |
|---|---|---|---|---|---|
| | REQUIRED | RECEIVED | Less than Average Level of Service Provided (OVERKILL) | Equal to or Greater than Average Level of Service, and Get It (SATISFIED) | Equal to or Greater than Average Level of Service, and Receive Less (DISSATISFIED) |
| Environmental Planning | Insufficient Response | | | | |
| Physical Site Planning | Insufficient Response | | | | |
| Consulting | 4.65 | 4.76 | 35.3 | 52.9 | 11.8 |
| Documentation | 6.53 | 6.59 | 34.4 | 25.0 | 40.6 |
| Training | 6.48 | 6.10 | 34.4 | 41.5 | 24.1 |
| Installation Planning | 5.09 | 5.22 | 39.1 | 43.5 | 17.4 |
| Hardware Maintenance | 8.19 | 7.56 | 28.1 | 31.3 | 40.6 |
| Software Maintenance | N/A | N/A | N/A | N/A | N/A |
| Supplies Sales | 7.55 | 7.14 | 20.7 | 37.9 | 41.4 |
| Add-on Sales | 4.81 | 4.43 | 42.9 | 33.3 | 23.8 |
| Site Audits | Insufficient Response | | | | |
| Relocation | 3.23 | 3.00 | 61.5 | 24.1 | 15.4 |
| Deinstallation | 3.18 | 1.82 | 63.6 | 18.2 | 18.2 |

Rating: 1 = Low, 10 = High

= Area Requiring Improvement

mental and physical site planning, which received an insufficient number of responses to analyze. Both occurrences point out the users' low levels of requirements in these areas and the need to redirect resources.

- Documentation quality also needs to be improved as only 25% of users found documentation satisfactory, and over 40% did not receive what they required. As with copier users, the low level of user sophistication requires that this service be satisfactorily provided.

- Consulting is the only service that received a satisfactory rating from users.

- An excellent revenue opportunity lies in improving sales of supplies, where more users reported dissatisfaction with their service than satisfaction.

## D. PBX, PABX USERS' REQUIREMENTS

- The PBX, PABX sample was comprised of AT&T, GTE, and Rolm users. Exhibit III-3 provides full details of responses.

- PBX, PABX users reported the second highest overall rating, receiving 40% satisfactory ratings in nine categories, and 50% satisfactory in three (environmental planning, physical site planning, and installation planning).

- The only area requiring immediate attention is software maintenance, where over 45% of the users received unsatisfactory service.

- Deinstallation is another service in which vendors could improve.

EXHIBIT III-3

## USER SERVICE REQUIREMENT VERSUS LEVEL OF SERVICE RECEIVED

## PRODUCT: PBX, PABX

| TYPE OF SERVICE PROVIDED | AVERAGE LEVEL OF SERVICE | | PERCENT OF USERS REQUIRING | | |
|---|---|---|---|---|---|
| | REQUIRED | RECEIVED | Less than Average Level of Service Provided (OVERKILL) | Equal to or Greater than Average Level of Service, and Get It (SATISFIED) | Equal to or Greater than Average Level of Service, and Receive Less (DISSATISFIED) |
| Environmental Planning | 4.80 | 6.35 | 30.0 | 65.0 | 5.0 |
| Physical Site Planning | 5.92 | 7.15 | 19.2 | 65.4 | 15.4 |
| Consulting | 6.07 | 6.90 | 41.4 | 44.8 | 13.8 |
| Documentation | 8.07 | 7.45 | 20.7 | 44.8 | 34.5 |
| Training | 6.45 | 6.55 | 37.9 | 41.4 | 20.7 |
| Installation Planning | 7.66 | 7.76 | 24.1 | 51.8 | 24.1 |
| Hardware Maintenance | 9.10 | 8.86 | 24.1 | 48.0 | 37.9 |
| Software Maintenance | 8.05 | 7.68 | 22.7 | 31.8 | 45.5 |
| Supplies Sales | 6.19 | 6.04 | 44.4 | 40.8 | 14.8 |
| Add-on Sales | 7.96 | 7.28 | 20.7 | 48.3 | 31.0 |
| Site Audits | 4.42 | 3.63 | 41.7 | 37.5 | 20.8 |
| Relocation | 6.19 | 5.42 | 42.3 | 38.5 | 19.2 |
| Deinstallation | 6.16 | 3.64 | 36.0 | 24.0 | 40.0 |

Rating 1 = Low, 10 = High

= Area Requiring Improvement

## E. PERSONAL COMPUTER USERS' REQUIREMENTS

- Users of Apple, DEC, Hewlett-Packard, IBM, Osborne, and Xerox personal computers comprised the sample. Exhibit III-4 provides full details of responses.

- Personal computer users reported the least satisfaction with their service requirements, with dissatisfaction ratings of at least 25% in six of the ten possible service areas.

- The area most obviously requiring attention is user documentation, which over 55% of the users rated unsatisfactory. Only 8% felt that their requirements were being met. Since both consulting and training services also rated below average, this service is even more vital to users' operations and should warrant immediate improvement.

- The areas of hardware and software maintenance received excessively high dissatisfaction responses (50% and 45% respectively).

- Users reported that they received more service than they required (overkill) in the three planning areas. Yet with the increased interest in and concern for ergonomics, more emphasis should be placed upon these areas, especially considering the low satisfaction levels received in the areas of physical site planning (13% satisfied) and environmental planning (less than 7% satisfied).

- Supplies sales is the only service currently receiving satisfactory ratings from users, yet another apparent revenue source, add-on sales, received relatively high dissatisfaction and overkill ratings, suggesting a redirection of efforts in that service.

EXHIBIT III-4

USER SERVICE REQUIREMENT VERSUS LEVEL OF SERVICE RECEIVED
PRODUCT: PERSONAL COMPUTERS

| TYPE OF SERVICE PROVIDED | AVERAGE LEVEL OF SERVICE | | PERCENT OF USERS REQUIRING | | |
|---|---|---|---|---|---|
| | REQUIRED | RECEIVED | Less than Average Level of Service Provided (OVERKILL) | Equal to or Greater than Average Level of Service, and Get It (SATISFIED) | Equal to or Greater than Average Level of Service, and Receive Less (DISSATISFIED) |
| Environmental Planning | 2.60 | 2.13 | 73.3 | 6.7 | 20.0 |
| Physical Site Planning | 2.40 | 2.00 | 73.3 | 13.4 | 13.3 |
| Consulting | 4.41 | 3.66 | 43.3 | 18.9 | 37.8 |
| Documentation | 7.08 | 5.82 | 36.1 | 8.2 | 55.7 |
| Training | 4.17 | 3.59 | 44.8 | 27.6 | 27.6 |
| Installation Planning | 2.95 | 2.16 | 57.9 | 21.0 | 21.1 |
| Hardware Maintenance | 6.45 | 5.00 | 22.8 | 26.3 | 50.9 |
| Software Maintenance | 4.91 | 3.55 | 36.4 | 18.1 | 45.5 |
| Supplies Sales | 4.36 | 4.48 | 39.4 | 42.4 | 18.2 |
| Add-on Sales | 5.50 | 4.85 | 42.5 | 22.5 | 35.0 |
| Site Audits | N/A | N/A | N/A | N/A | N/A |
| Relocation | N/A | N/A | N/A | N/A | N/A |
| Deinstallation | N/A | N/A | N/A | N/A | N/A |

Rating: 1 = Low, 10 = High

= Area Requiring Improvement

## E. WORD PROCESSOR USERS' REQUIREMENTS

- Word processor users interviewed were predominantly IBM, NBI, Wang, and Xerox. Exhibit III-5 provides full details of responses.

- Users reported high satisfaction with the following services: environmental planning, physical site planning, supplies sales, and training.

- Installation planning, however, was the only service that received satisfied responses by over 50% of the respondents.

- Users received over 50% overkill in the following areas: physical site planning, site audits, and relocations.

- Documentation requires immediate attention; over 47% of the users were dissatisfied.

- Training, hardware maintenance, and software maintenance also require attention.

## F. WORKSTATION USERS' REQUIREMENTS

- Workstation interviews included Burroughs, Hewlett-Packard, NCR, Univac, and Wang models. Exhibit III-6 provides more details of responses.

- Areas showing need for most improvement are site audits and deinstallations, both receiving 54% dissatisfied ratings.

- Again, documentation is a service that requires attention, with more people dissatisfied with it than satisfied.

EXHIBIT III-5

## USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED

PRODUCT: WORD PROCESSORS

| TYPE OF SERVICE PROVIDED | AVERAGE LEVEL OF SERVICE | | PERCENT OF USERS REQUIRING | | |
|---|---|---|---|---|---|
| | REQUIRED | RECEIVED | Less than Average Level of Service Provided (OVERKILL) | Equal to or Greater than Average Level of Service, and Get It (SATISFIED) | Equal to or Greater than Average Level of Service and Receive Less (DISSATISFIED) |
| Environmental Planning | 3.82 | 4.53 | 48.9 | 44.4 | 6.7 |
| Physical Site Planning | 4.11 | 4.61 | 54.5 | 31.9 | 13.6 |
| Consulting | 5.89 | 5.93 | 29.1 | 41.8 | 29.1 |
| Documentation | 7.81 | 7.14 | 18.6 | 34.3 | 47.1 |
| Training | 7.16 | 6.41 | 22.9 | 36.1 | 41.0 |
| Installation Planning | 5.10 | 5.20 | 34.7 | 51.0 | 14.3 |
| Hardware Maintenance | 7.79 | 7.87 | 24.3 | 35.7 | 40.0 |
| Software Maintenance | 7.00 | 6.31 | 27.6 | 31.0 | 41.4 |
| Supplies Sales | 5.60 | 5.83 | 31.0 | 44.9 | 24.1 |
| Add-on Sales | 6.00 | 5.72 | 33.3 | 33.2 | 31.5 |
| Site Audits | 2.74 | 2.93 | 54.8 | 30.9 | 14.3 |
| Relocation | 4.05 | 4.16 | 52.3 | 34.1 | 13.6 |
| Deinstallation | 2.96 | 3.49 | 44.4 | 40.0 | 15.6 |

Rating: 1 = Low, 10 = High

= Area Requiring Improvement

EXHIBIT III-6

## USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED

PRODUCT: WORKSTATIONS

| TYPE OF SERVICE PROVIDED | AVERAGE LEVEL OF SERVICE | | PERCENT OF USERS REQUIRING | | |
|---|---|---|---|---|---|
| | REQUIRED | RECEIVED | Less than Average Level of Service Provided (OVERKILL) | Equal to or Greater than Average Level of Service, and Get It (SATISFIED) | Equal to or Greater than Average Level of Service, and Receive Less (DISSATISFIED) |
| Environmental Planning | 6.00 | 6.10 | 45.0 | 50.0 | 5.0 |
| Physical Site Planning | 6.00 | 6.24 | 41.2 | 47.0 | 11.8 |
| Consulting | 5.51 | 5.74 | 20.9 | 46.5 | 32.6 |
| Documentation | 6.27 | 6.13 | 25.4 | 34.9 | 39.7 |
| Training | 4.50 | 4.47 | 16.7 | 52.7 | 30.6 |
| Installation Planning | 6.00 | 5.61 | 50.0 | 28.6 | 21.4 |
| Hardware Maintenance | 7.02 | 6.75 | 42.3 | 23.8 | 34.9 |
| Software Maintenance | 7.41 | 6.69 | 28.1 | 40.6 | 31.3 |
| Supplies Sales | 4.61 | 5.04 | 28.6 | 57.1 | 14.3 |
| Add-on Sales | 6.10 | 5.59 | 41.0 | 23.1 | 35.9 |
| Site Audits | 2.77 | 3.15 | 7.7 | 38.5 | 53.8 |
| Relocation | 5.38 | 4.25 | 37.5 | 31.2 | 31.3 |
| Deinstallation | 3.31 | 3.15 | 7.7 | 38.5 | 53.8 |

Rating: 1 = Low, 10 = High

= Area Requiring Improvement

- Installation planning, with one-half the users reporting overkill, requires a redirection of effort.

- Users reported overall satisfaction with environmental planning, training, and sales of supplies.

- Hardware maintenance, with such a relatively high overkill rating and low satisfaction rating, points to a need for more consistent overall performance.

# IV MAINTENANCE REQUIREMENTS

# IV MAINTENANCE REQUIREMENTS

## A. SYSTEM AVAILABILITY REQUIREMENTS

- Perhaps the most important concern of the end users is the amount of time they can actually use the machine, which is otherwise known as system availability. system availability has been defined as:

$$\frac{\text{Scheduled Use}}{\text{Actual Use + Downtime + Recovery Time}}$$

- Vendors frequently dismiss recovery time from this equation. Also, downtime starts, in the vendors' eyes, at the point of contact between user and service organization, instead of at the time of failure. In both of these cases, however, the user is without use of his equipment from the time of failure to the time his machine is fully up and operating.

- Office products users require less system availability, on the average, than do other systems users. As shown in Exhibit IV-1, users' system availability requirements are adequately satisfied.

- Again, it is important to measure each product type against itself, not against other product types, due to the varying requirements of each user group. The results of Exhibit IV-1 do show each product type user groups' satisfaction with their system availability.

EXHIBIT IV-1

SYSTEM AVAILABILITY -
USER REQUIREMENTS VERSUS VENDOR ACTUALS BY PRODUCT

| PRODUCT | MEAN TIME (Hours) | | NUMBER OF RESPONSES | |
|---|---|---|---|---|
| | REQUIRED | ACTUAL | REQUIRED | ACTUAL |
| All Types | 92.60 | 93.88 | 305 | 305 |
| Copiers | 89.84 | 92.20 | 51 | 51 |
| Facsimile Machines | 94.02 | 92.09 | 32 | 32 |
| PBX, PABX | 95.83 | 95.37 | 29 | 29 |
| Personal Computers | 87.97 | 90.92 | 61 | 61 |
| Word Processors | 93.81 | 95.10 | 70 | 70 |
| Workstations | 95.80 | 96.96 | 62 | 62 |

- Of all product types, PBX users and workstation users require the greatest system availability, each requiring over 95%, while copier users (just under 90%) and personal computer users (around 88%) require the least. PC users may have lower expectations because their equipment costs less.

- Copier users' availability actuals, in fact, far exceed their requirements.

- When asked about their system availability requirements during their most critical applications, the only product type that met the users' requirements was personal computers (although workstations came close). This is also a result of the personal computer user's lower expectations. Exhibit IV-2 provides full details.

## B. SOURCE OF MAINTENANCE

- Users were asked to rate the importance of a single source of maintenance for their products. Exhibit IV-3 shows the results by product type. The range of responses indicate that users are likely to consider alternative sources such as third-party maintenance.

- Not surprisingly, personal computers were most likely to consider alternative sources, due in large part to their dissatisfaction with current service.

- Workstation users were also willing to use other maintenance opportunities, a result of greater familiarity with third-party maintenance.

- Copier users tend least toward alternative sources. This shows copier vendors' success in servicing their customers' needs.

EXHIBIT IV-2

## SYSTEM AVAILABILITY REQUIREMENTS FOR USERS' MOST CRITICAL APPLICATIONS

| PRODUCT | AVAILABILITY REQUIRED (percent) | | NUMBER OF RESPONSES |
|---|---|---|---|
| | MEAN | STANDARD DEVIATION | |
| All Types | 93.99 | 17.91 | 305 |
| Copiers | 96.00 | 6.31 | 51 |
| Facsimile Machines | 95.86 | 30.87 | 32 |
| PBX, PABX | 99.42 | 1.98 | 29 |
| Personal Computers | 90.95 | 21.99 | 61 |
| Word Processors | 96.37 | 12.67 | 70 |
| Workstations | 97.04 | 3.56 | 62 |

EXHIBIT IV-3

THE IMPORTANCE TO USERS OF A SINGLE SOURCE OF MAINTENANCE

| PRODUCT | MEAN | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 7.71 | 2.67 | 305 |
| Copiers | 8.75 | 2.29 | 51 |
| Facsimile Machines | 8.00 | 2.27 | 32 |
| PBX, PABX | 8.52 | 1.79 | 29 |
| Personal Computers | 6.21 | 3.17 | 61 |
| Word Processors | 8.26 | 2.30 | 70 |
| Workstations | 7.23 | 2.72 | 62 |

Rating: 1 = Low, 10 = High

## C. USER ATTITUDES TOWARD ALTERNATIVE DELIVERY METHODS

- Office product users have traditionally been expected to perform a certain amount of self-maintenance, especially copier and personal computer users. Exhibit IV-4 measures users' willingness to engage in alternative delivery methods such as self-maintenance.

- It is clear that users still prefer on-site, vendor-supplied maintenance, both for hardware and software services. Users are beginning to accept increased involvement with support centers, as long as they perceive that the vendors are still involved in the maintenance process. Users are not enthusiastic about replacing hardware or software or making deliveries to repair centers.

- Users' responses by product type are supplied in Exhibits IV-5 through IV-10.

## D. RESPONSIVENESS TO HARDWARE FAILURES

- The speed of response often influences users' overall image of the service that they are receiving from the maintenance organization. Some vendors realize the importance of response time, as indicated by the existence of response time guarantees. The important factor, however, is the vendors' ability to meet the response requirement of the user.

- Exhibit IV-11 demonstrates how office products vendors as a group perform in meeting users' requirements. The following conclusions can be drawn from the exhibit:

  - Office products vendors, on the whole, are meeting or exceeding a large majority (over 80%) of their users' requirements.

EXHIBIT IV-4

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 8.32 | 305 | 8.24 | 251 |
| 2) User involvement in diagnosis working with support center | 6.42 | 305 | 6.43 | 250 |
| 3) User involvement replacing circuit boards, other components, or patching software | 4.73 | 305 | 4.91 | 250 |
| 4) User delivering portable modules to repair centers | 3.98 | 305 | 4.20 | 250 |
| 5) On-site stand-by of service personnel during critical periods | 4.02 | 305 | 4.26 | 247 |

EXHIBIT IV-5

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)
PRODUCT: COPIERS

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 8.92 | 51 | N/A | N/A |
| 2) User involvement in diagnosis working with support center | 6.11 | 51 | N/A | N/A |
| 3) User involvement replacing circuit boards, other components, or patching software | 3.90 | 51 | N/A | N/A |
| 4) User delivering portable modules to repair centers | 2.43 | 51 | N/A | N/A |
| 5) On-site stand-by of service personnel during critical periods | 3.20 | 51 | N/A | N/A |

EXHIBIT IV-6

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)
PRODUCT: FACSIMILE MACHINES

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 8.69 | 32 | N/A | N/A |
| 2) User involvement in diagnosis working with support center | 5.69 | 32 | N/A | N/A |
| 3) User involvement replacing circuit boards, other components, or patching software | 2.97 | 32 | N/A | N/A |
| 4) User delivering portable modules to repair centers | 3.06 | 32 | N/A | N/A |
| 5) On-site stand-by of service personnel during critical periods | 3.00 | 32 | N/A | N/A |

EXHIBIT IV-7

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)
PRODUCT: PBX, PABX

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 8.28 | 29 | 7.28 | 29 |
| 2) User involvement in diagnosis working with support center | 6.21 | 29 | 5.34 | 29 |
| 3) User involvement replacing circuit boards, other components, or patching software | 5.10 | 29 | 4.37 | 29 |
| 4) User delivering portable modules to repair centers | 3.10 | 29 | 3.27 | 29 |
| 5) On-site stand-by of service personnel during critical periods | 6.76 | 29 | 5.82 | 29 |

EXHIBIT IV-8

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)
PRODUCT: PERSONAL COMPUTERS

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 6.95 | 61 | 6.67 | 61 |
| 2) User involvement in diagnosis working with support center | 6.57 | 61 | 6.39 | 61 |
| 3) User involvement replacing circuit boards, other components, or patching software | 5.21 | 61 | 5.25 | 61 |
| 4) User delivering portable modules to repair centers | 5.36 | 61 | 5.26 | 61 |
| 5) On-site stand-by of service personnel during critical periods | 2.98 | 61 | 2.95 | 61 |

EXHIBIT IV-9

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)
PRODUCT: WORD PROCESSORS

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 8.83 | 70 | 8.75 | 65 |
| 2) User involvement in diagnosis working with support center | 6.99 | 70 | 6.91 | 65 |
| 3) User involvement replacing circuit boards, other components, or patching software | 5.29 | 70 | 5.28 | 65 |
| 4) User delivering portable modules to repair centers | 4.09 | 70 | 4.11 | 65 |
| 5) On-site stand-by of service personnel during critical periods | 4.41 | 70 | 4.13 | 70 |

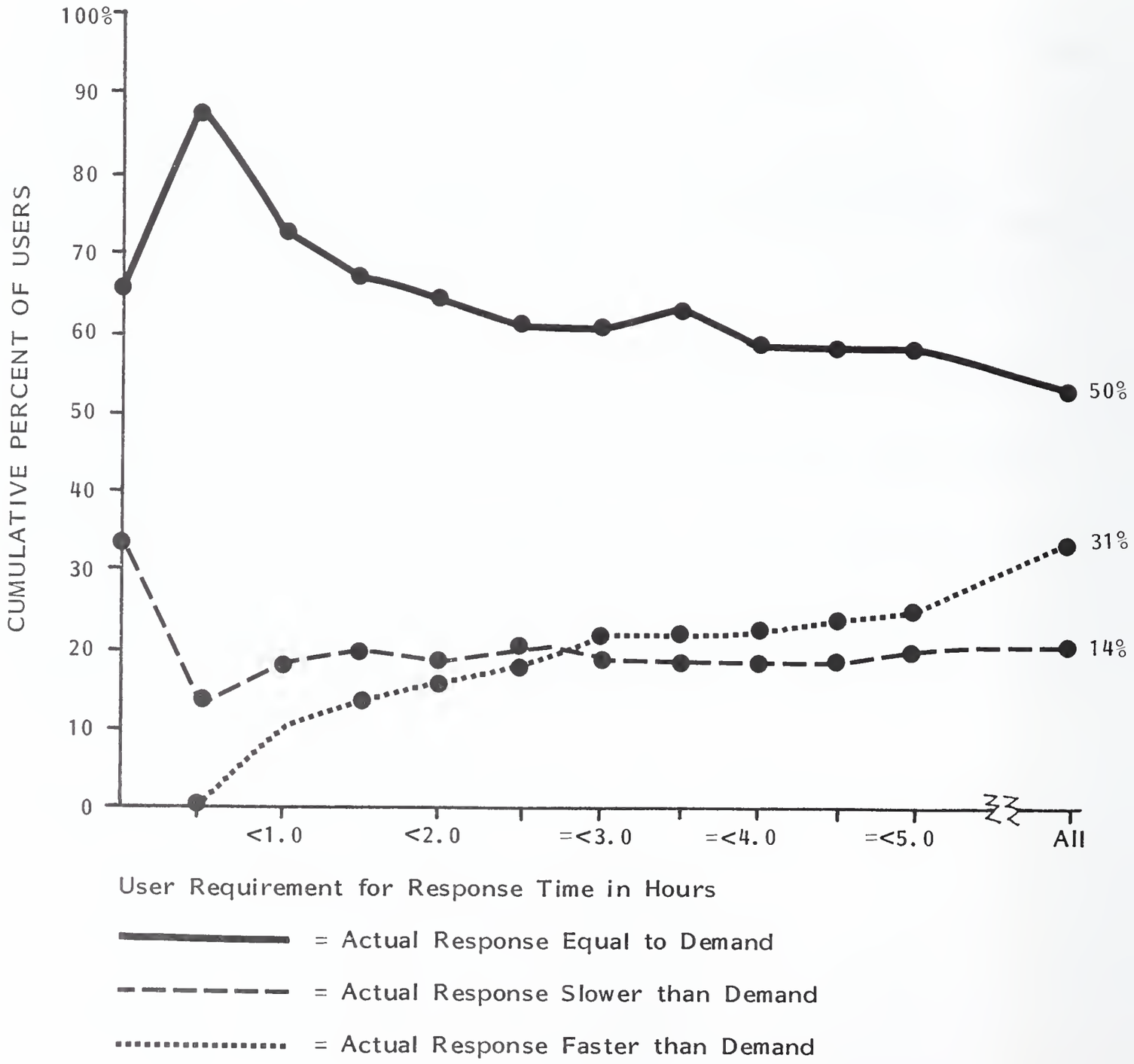
EXHIBIT IV-10

USER ATTITUDES TOWARD
ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE
(Assumes Appropriate Premium or Discount)
PRODUCT: WORKSTATIONS

| MAINTENANCE DELIVERY METHOD | RATING (1-10) | | | |
|---|---|---|---|---|
| | HARDWARE | | SOFTWARE | |
| | Mean | Number of Responses | Mean | Number of Responses |
| 1) Traditional on-site response to trouble calls | 8.42 | 62 | 8.42 | 62 |
| 2) User involvement in diagnosis working with support center | 6.35 | 62 | 6.35 | 62 |
| 3) User involvement replacing circuit boards, other components, or patching software | 4.97 | 62 | 4.97 | 62 |
| 4) User delivering portable modules to repair centers | 4.23 | 62 | 4.23 | 62 |
| 5) On-site stand-by of service personnel during critical periods | 4.55 | 62 | 4.55 | 62 |

EXHIBIT IV-11

CUMULATIVE USER REQUIREMENTS - RESPONSE TIME TO TROUBLE CALLS VERSUS ACTUAL AVERAGE RESPONSE TIME BY VENDORS



- At the four-hour-and-above response requirement level, the increasing number of "faster than required" responses indicates that vendors are spending too much to satisfy a few.

- At the required response level of two hours and less, a larger proportion of users are receiving less than required response time, suggesting an area of needed improvement.

- The optimum response time appears to be between the two and one-half and three-hour levels, where the "slower than demand" line crosses the "faster than demand" line.

- Exhibit IV-12 provides vendors' response time performance broken down by product type. Here again we see that users are generally receiving better response times than they require.

  - Only two of the six product type groups, copiers and facsimile machines, failed to meet their users' response time requirements. Note that copier users are fairly satisfied with their maintenance, and facsimile machine users are not (see Exhibit II-4).

  - Personal computer users' response requirement of over 12 hours is easily satisfied by vendors, yet due to extremely high repair times, among other reasons, overall service is poor.

- The above points suggest that, while response time is important, it is by no means the most important factor in judging maintenance quality.

EXHIBIT IV-12

## REQUIREMENTS FOR RESPONSE TIME TO HARDWARE FAILURES VERSUS ACTUALS BY PRODUCT TYPE

| PRODUCT | MEAN TIME (hours) | | NUMBER OF RESPONSES |
|---|---|---|---|
| | REQUIRED | ACTUAL | |
| All Types | 6.20 | 5.73 | 305 |
| Copiers | 4.71 | 5.67 | 51 |
| Facsimile Machines | 7.25 | 9.78 | 32 |
| PBX, PABX | 5.11 | 3.61 | 29 |
| Personal Computers | 12.54 | 9.34 | 61 |
| Word Processors | 3.69 | 3.44 | 70 |
| Workstations | 4.10 | 3.79 | 62 |

## E. REPAIR TIME

- Repair time is defined as the time between the moment the engineer begins to work on the problem and the moment when it is solved.

- From Exhibit IV-13, we see that the amount of repair time varies greatly from product to product.

- Actual repair time experienced by both copier users and word processor users is quite low, averaging 1.6 hours and 2.1 hours respectively.

- PBX users, workstation users, and facsimile machine users all report repair times of roughly four hours.

- The most startling response came from personal computer users, who averaged almost a 20-hour repair time. Two users experienced average repair times of almost two weeks, accounting for the wide range of responses.

- Exhibit IV-14 provides users' ratings of vendors' ability to diagnose hardware problems and to make quality repairs. These ratings reflect the repair time received by each product type user.

- Exhibit IV-15 provides user ratings of vendors' ability to maintain software. Again, as in hardware, users of personal computers rate their software maintenance lower than the other product types.

## F. THIRD-PARTY MAINTENANCE AND MANAGEMENT CONTRACTS

- A benefit of using third-party maintenance (TPM) firms is that they coordinate and perform maintenance on multiple vendor systems, thus providing users with a single source of maintenance.

EXHIBIT IV-13

REPAIR TIME EXPERIENCED BY USERS
(hours)

| PRODUCT | MEAN* | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 6.28 | 28.78 | 305 |
| Copiers | 1.60 | 1.34 | 51 |
| Facsimile Machines | 4.49 | 8.37 | 32 |
| PBX, PABX | 3.71 | 6.71 | 29 |
| Personal Computers | 19.42 | 61.44 | 61 |
| Word Processors | 2.07 | 3.19 | 70 |
| Workstations | 4.19 | 11.74 | 62 |

* Rating: 1 = Low, 10 = High

EXHIBIT IV-14

## USER RATINGS OF VENDOR ABILITY TO DIAGNOSE HARDWARE PROBLEMS AND TO MAKE QUALITY REPAIRS

| PRODUCT | MEAN* | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 7.81 | 1.83 | 272 |
| Copiers | 8.24 | 1.34 | 51 |
| Facsimile Machines | 7.58 | 2.38 | 31 |
| PBX, PABX | 8.38 | 2.01 | 29 |
| Personal Computers | 6.86 | 2.55 | 37 |
| Word Processors | 7.56 | 2.22 | 70 |
| Workstations | 7.76 | 1.89 | 54 |

* Rating: 1 = Low, 10 = High

EXHIBIT IV-15

## USER RATINGS OF VENDORS' ABILITY TO MAINTAIN SOFTWARE

| PRODUCT | MEAN* | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 7.24 | 2.31 | 126 |
| Copiers | ** | ** | ** |
| Facsimile Machines | ** | ** | ** |
| PBX, PABX | 8.05 | 1.68 | 19 |
| Personal Computers | 5.70 | 3.28 | 20 |
| Word Processors | 7.64 | 2.35 | 50 |
| Workstations | 7.19 | 1.43 | 37 |

* Rating: 1 = Low, 10 = High

** Does Not Apply

- Vendors have responded by offering a maintenance management contract that stipulates that they will act as a "clearing house" for all fault calls on equipment other than their own and that they will coordinate the subcontracting of maintenance on such equipment.

- Exhibit IV-16 demonstrates each product type's experience with third-party maintenance, and each type's willingness to consider either TPM or maintenance management contracts as a single source of maintenance.

- Facsimile users seemed least experienced with TPM and least willing to consider either TPM or management contracts as single-source possibilities.

- Copier and word processor users had greater experience with TPM as a maintenance source, but while copier users expressed little desire to consider TPM or management contracts as a single source, word processor users seemed most willing of all product types to use TPM or management contracts as their sole service, with over 20% willing to consider each option.

- Approximately 25% of PBX, workstation, and personal computer users have had some experience with TPM. Workstation users are more or less willing to consider both TPM and management contracts as a single source, but PBX users are only interested in management contracts as an alternative, and personal computers users see TPM as a single source alternative.

EXHIBIT IV-16

PERCENT OF USERS USING THIRD-PARTY MAINTENANCE OR CONSIDERING MAINTENANCE MANAGEMENT CONTRACTS

| PRODUCT | Now Using TPM For Some Equipment (percent) | | | Have Considered TPM as Single Source For Maintenance (percent) | | | Would Consider Management Contract as Alternative to TPM (percent) | | | NUMBER OF RESPONDENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | YES | NO | N/A | YES | NO | N/A | YES | NO | N/A | |
| All Types | 18.3% | 80.4% | 1.3% | 15.0% | 83.7% | 1.3% | 11.4% | 86.6% | 2.0% | 305 |
| Copiers | 11.8 | 88.2 | 0.0 | 7.8 | 92.2 | 0.0 | 5.9 | 94.1 | 0.0 | 51 |
| Facsimile Machines | 6.2 | 93.7 | 0.0 | 0.0 | 100.0 | 0.0 | 3.1 | 96.9 | 0.0 | 32 |
| PBX, PABX | 24.1 | 75.9 | 0.0 | 6.9 | 93.1 | 0.0 | 17.2 | 82.8 | 0.0 | 29 |
| Personal Computers | 26.2 | 70.5 | 3.3 | 23.0 | 73.8 | 3.3 | 1.6 | 93.4 | 4.9 | 61 |
| Word Processor | 11.4 | 87.1 | 1.4 | 20.0 | 78.6 | 1.4 | 22.9 | 74.3 | 2.9 | 70 |
| Workstations | 25.8 | 72.6 | 1.6 | 19.4 | 79.0 | 1.6 | 14.5 | 83.9 | 1.6 | 62 |

# V FIELD SERVICE COMMUNICATIONS

# V FIELD SERVICE COMMUNICATIONS

## A. INTRODUCTION

- Users' overall service images can be directly related to their ability, or inability, to communicate their needs to their vendors and to elicit enough communication in return to improve their operations.

- A vendor's field service is important because it is often the sole contact with the user after the sale and installation. The user requires contact with the service organization at two levels:

  - At the field engineer level, which makes up the majority of the user-vendor interaction.

  - At the field service management level, to alleviate any question or problem that cannot be rectified at the engineer's level.

## B. FIELD ENGINEER AND FIELD SERVICE MANAGEMENT COMMUNICATIONS

- Users were asked to rate the quality of communication with field service engineers in both hardware and software areas for all product types. Exhibit V-1 provides users' responses.

EXHIBIT V-1

USER RATINGS OF FIELD SERVICE ENGINEERS' COMMUNICATIONS

| PRODUCT | HARDWARE | | | SOFTWARE | | |
|---|---|---|---|---|---|---|
| | Mean* | Standard Deviation | Number of Responses | Mean* | Standard Deviation | Number of Responses |
| All Types | 7.83 | 1.89 | 275 | 7.01 | 2.38 | 129 |
| Copiers | 8.18 | 1.73 | 51 | ** | ** | ** |
| Facsimile Machines | 7.23 | 2.38 | 31 | ** | ** | ** |
| PBX, PABX | 8.00 | 2.04 | 29 | 7.68 | 1.70 | 19 |
| Personal Computers | 7.20 | 2.30 | 41 | 5.66 | 3.23 | 21 |
| Word Processors | 7.51 | 2.39 | 70 | 7.31 | 2.27 | 52 |
| Workstations | 8.09 | 1.56 | 53 | 7.11 | 1.89 | 37 |

* Rating: 1 = Low, 10 = High

** Does Not Apply

- In all cases, users perceived communications with hardware engineers to be at a higher level than with software engineers.

- Although overall improvement is needed in all product types' communication, personal computer vendors should especially improve the amount and quality of communication with users.

- Users also rated the quality of communications with field service management, as shown in Exhibit V-2.

  - Again, users' communication with service management reflects their overall service rating.

  - Personal computer users report the lowest ratings with service management.

- Users' ratings of vendors' general responsiveness are very similar to the communication ratings. The amount and quality of communications indicated in Exhibits V-1 and V-2 also correlate with the overall user ratings as shown in Exhibit II-4.

## C. TROUBLE CALL DISPATCHING AND ESCALATION PROCEDURES

- Users were asked to rate their vendors on responsiveness in two areas:

  - Speed and efficiency of initial trouble call dispatching.

  - Speed and efficiency of the escalation procedure when the initial engineer dispatched cannot alleviate the problem.

EXHIBIT V-2

## USER RATINGS OF VENDOR SERVICE MANAGEMENT COMMUNICATIONS AND RESPONSIVENESS OF VENDOR SERVICE ORGANIZATIONS

| PRODUCT | MANAGEMENT COMMUNICATIONS | | | GENERAL RESPONSIVENESS | | |
|---|---|---|---|---|---|---|
| | Mean* | Standard Deviation | Number of Responses | Mean* | Standard Deviation | Number of Responses |
| All Types | 7.53 | 2.11 | 2.71 | 7.76 | 2.05 | 2.78 |
| Copiers | 8.10 | 1.75 | 48 | 8.12 | 1.61 | 51 |
| Facsimile Machines | 7.30 | 2.45 | 30 | 7.50 | 2.49 | 32 |
| PBX, PABX | 8.38 | 1.37 | 29 | 8.90 | 1.32 | 29 |
| Personal Computers | 6.53 | 2.45 | 40 | 6.24 | 2.69 | 42 |
| Word Processors | 7.17 | 2.62 | 70 | 7.64 | 2.09 | 70 |
| Workstations | 7.48 | 1.89 | 54 | 8.00 | 1.73 | 54 |

*Rating: 1 = Low, 10 = High

- Only two product types, PBX and workstations, received a rating of eight or better. Personal computer vendors rated less than seven. Since user satisfaction with service can be tied directly to their perceived satisfaction with the dispatching of their trouble calls, these ratings need to be improved.

- In the area of escalation procedure, only PBX vendors rated over eight. Again, personal computer vendors fared poorly, this time receiving a score of under six.

- Exhibit V-3 provides users' ratings of the vendors' dispatching trouble calls and escalation procedures.

## D. RESOLUTION OF INVOICING DISPUTES

- Although invoicing, as well as problems resulting from invoicing, is usually handled by administration, users' satisfaction with the invoicing process can directly affect the image of the field service organization. The field engineer is usually the first line of contact concerning any billing problems between the user and the vendor.

- Exhibit V-4 provides users' ratings of the invoicing dispute resolution procedures of office product vendors. Note the trend in satisfaction with invoicing dispute resolution with the overall service ratings.

## E. VENDOR INITIATIVE

- Users rely on the field service engineer to provide service beyond the repair of any problem with the equipment. The engineer is often asked for suggestions on improving operations at the user's site due to the FE's familiarity

EXHIBIT V-3

## USER RATINGS OF VENDORS' DISPATCHING TROUBLE CALLS AND ESCALATION PROCEDURES

| PRODUCT | DISPATCHING TROUBLE CALLS | | | ESCALATION PROCEDURES | | |
|---|---|---|---|---|---|---|
| | Mean* | Standard Deviation | Number of Responses | Mean* | Standard Deviation | Number of Responses |
| All Types | 7.83 | 1.82 | 256 | 7.53 | 2.08 | 201 |
| Copiers | 7.86 | 1.80 | 51 | 7.89 | 1.74 | 38 |
| Facsimile Machines | 7.26 | 2.02 | 31 | 7.33 | 2.12 | 24 |
| PBX, PABX | 8.76 | 1.57 | 29 | 8.35 | 1.47 | 26 |
| Personal Computers | 6.77 | 2.28 | 27 | 5.86 | 2.36 | 22 |
| Word Processors | 7.72 | 2.15 | 70 | 7.65 | 2.13 | 52 |
| Workstations | 8.00 | 1.37 | 48 | 7.54 | 2.08 | 39 |

* Rating: 1 = Low, 10 = High

EXHIBIT V-4

## USER RATINGS OF VENDOR RESOLUTIONS OF INVOICING DISPUTES

| PRODUCT | MEAN* | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 7.38 | 2.10 | 194 |
| Copiers | 7.77 | 1.84 | 31 |
| Facsimile Machines | 7.26 | 2.54 | 23 |
| PBX, PABX | 8.15 | 1.59 | 27 |
| Personal Computers | 6.92 | 2.34 | 25 |
| Word Processors | 7.28 | 2.16 | 47 |
| Workstations | 7.02 | 2.08 | 41 |

* Rating: 1 = Low, 10 = High

with the equipment at that particular site and at similar installations. The user also recognizes that the engineer has much more access to information from the vendor, thus providing "shortcuts" through the vendor's organization. Finally, the users develop a trust for the engineer, and see him as an unbiased source of information and advice.

- All product types demonstrate low vendor initiative in improving user operations, as shown in Exhibit V-5. Copiers received the highest rating with just over a seven, while personal computers vendors received a rating lower than four.

- Due to the fact that office product users are potential buyers of more equipment, vendors should take steps towards improving all areas of communication in order to prevent user alienation.

EXHIBIT V-5

USER RATINGS OF VENDORS' INITIATIVE IN IMPROVING USER OPERATIONS

| PRODUCT | MEAN* | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 6.14 | 2.68 | 257 |
| Copiers | 7.04 | 2.25 | 48 |
| Facsimile Machines | 6.14 | 2.79 | 29 |
| PBX, PABX | 6.88 | 2.49 | 26 |
| Personal Computers | 3.89 | 2.68 | 35 |
| Word Processors | 6.11 | 3.04 | 70 |
| Workstations | 6.14 | 2.08 | 49 |

* Rating: 1 = Low, 10 = High

# VI FIELD SERVICE PRICING

# VI FIELD SERVICE PRICING

## A. USER RESISTANCE TO PRICE INCREASES

- Because hardware reliability has increased while its prices have come down, users are resisting service price increases for standard maintenance. In fact, users now expect maintenance prices to decrease because of these factors.

- Due to the overall lower cost of purchasing office equipment, the cost of its maintenance becomes more visible to users and actually becomes a factor in product selection. As purchase prices decline, the price of maintenance will become more and more important. Exhibit VI-1 shows users' attitudes toward price as a selection factor.

- This resistance to price increase will cause vendors to look at both extended and reduced services as areas in which revenues can be increased.

  - Extended services can be offered, with premiums that reflect the increased service level.

  - Service alternatives may be offered to provide the user with reduced service at a lower price.

EXHIBIT VI-1

PRICE AS A FACTOR IN SELECTING
EQUIPMENT AND MAINTANENCE

| PRODUCT | IMPORTANCE AS A CRITERIA IN SELECTION | | | | | |
|---|---|---|---|---|---|---|
| | PRICE OF EQUIPMENT | | | PRICE OF MAINTENANCE | | |
| | Mean* | Standard Deviation | Number of Responses | Mean* | Standard Deviation | Number of Responses |
| All Types | 7.28 | 2.04 | 293 | 6.69 | 2.24 | 293 |
| Copiers | 7.71 | 2.04 | 51 | 6.55 | 2.87 | 51 |
| Facsimile Machines | 7.63 | 2.21 | 32 | 7.31 | 1.97 | 32 |
| PBX, PABX | 7.79 | 1.63 | 29 | 7.97 | 1.59 | 29 |
| Personal Computers | 6.61 | 2.32 | 57 | 5.56 | 2.49 | 57 |
| Word Processors | 7.30 | 1.82 | 66 | 7.02 | 1.65 | 66 |
| Workstations | 6.91 | 2.13 | 58 | 6.43 | 2.14 | 58 |

* Rating 1 = Low, 10 = High

- New revenue sources, such as add-on equipment sales and supplies sales, may be incorporated into field engineering.

- Present contracts may be extended.

## B. USERS' REQUIREMENTS FOR EXTENDED SERVICES AND THEIR ATTITUDES TOWARD PREMIUMS

- Exhibit VI-2 establishes which extended services users required and what they felt was a reasonable price for each one.

- Users reported the greatest need for guaranteed response time, with almost 35% responding yes to this requirement. They considered an average premium of 4% of the basic maintenance charge to be acceptable.

- The availability of local supplies was also required by over 27% of the users, who were willing to pay almost 5% more than they now pay.

- The extended service with the largest premium value that was considered reasonable was guaranteed repair time: 15% of the users require this service, and they are willing to pay over 7% more to get it. This indicates that a large number of office product users are unhappy with the repair times taken by some vendors. The degree of this unhappiness is indicated by the wide range of responses.

- Sixty-one percent of the users felt that on-site maintenance was a necessity.

EXHIBIT VI-2

USERS' REQUIREMENTS FOR EXTENDED SERVICES AND THEIR ATTITUDES TOWARD PREMIUMS

| EXTENDED SERVICE | USERS RESPONDING YES TO REQUIREMENT | | REASONABLE PREMIUM AS PERCENT OF BASIC CHARGE FOR MAINTENANCE (percent) | |
|---|---|---|---|---|
| | NUMBER | PERCENT OF USERS | MEAN | STANDARD DEVIATION |
| On-site Maintenance | 187 | 61.1% | 1.36% | 8.20% |
| Guaranteed Uptime | 48 | 15.7 | 2.67 | 5.46 |
| Guaranteed Response Time | 106 | 34.6 | 4.00 | 7.82 |
| Local Supplies Inventories | 84 | 27.5 | 3.29 | 8.27 |
| Local Spare Parts Inventories | 49 | 16.0 | 4.75 | 8.33 |
| Preventive Maintenance and Engineering Changes During Off-prime Hours | 23 | 7.5 | 2.17 | 3.17 |
| Occasional Shift Coverage (Versus Fixed Schedule) | 26 | 8.5 | 2.50 | 4.77 |
| Guaranteed Repair Time (Hardware) | 46 | 15.0 | 7.15 | 16.82 |
| Guaranteed Turnaround on Software Problems | 16 | 5.2 | 3.81 | 12.43 |

## C. LEVEL OF PREMIUM THAT USERS ARE WILLING TO PAY

- It is not only important to know users' willingness to pay premiums for extended services, but also at what level premiums should be placed in order to optimize the amount of revenues brought in by the increased service.

- Exhibit VI-3 shows the percentage of users who are willing to pay a premium for each extended service at progressively higher premiums. For example, to receive guaranteed uptime:

  - 47.9% of users agree that guaranteed uptime is worth paying for.

  - 8.4% would be willing to pay at least a 5% premium.

  - 6.3% would be willing to pay at least a 15% premium.

  - 2.1% would be willing to pay at least a 20% premium.

- By multiplying the minimum premium by the percentage of users willing to pay for it, the optimum increase can be obtained. Simultaneously, this provides the percentage increase that can be expected over normal maintenance charge revenue. In this example, the optimum level of premium is 15%, yielding of 0.9% increase in overall maintenance charge revenue.

- There seems to be no particular premium that attracts optimum revenue increases. The amount of revenue added can only be correlated with the service provided.

- Guaranteed turnaround on software problems (with a 2.5% increase of revenue at a 40% premium), guaranteed repair time on hardware (with a 2.0% revenue increase at a 30% premium), and local spare parts inventories (with a 1.3% revenue increase at a 5% premium), appear to be the best chances at increasing revenues by providing extended services.

EXHIBIT VI-3

CUMULATIVE DISTRIBUTION OF REASONABLE PREMIUMS FOR EXTENDED SERVICES

| EXTENDED SERVICE | PERCENT OF USERS REQUIRING EXTENDED SERVICE WHO WILL PAY PREMIUM OVER BASE MAINTENANCE CHARGE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PREMIUM GROUPS | | | | | | | | | |
| | >0% | >5% | >10% | >15% | >20% | >25% | >30% | >40% | >50% | >75% |
| On-Site Maintenance | 8.0% | 4.3% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.1% | - |
| Guaranteed Uptime | 47.9 | 8.4 | 6.3 | 6.3 | 2.1 | - | - | - | - | - |
| Guaranteed Response Time | 46.2 | 14.1 | 6.5 | 5.6 | 2.8 | 2.8 | 2.8 | 0.9 | - | - |
| Local Supplies Inventories | 50.0 | 10.7 | 3.6 | 3.6 | 3.6 | 2.4 | 2.4 | 2.4 | - | - |
| Local Spare Parts Inventories | 53.1 | 26.4 | 4.0 | 4.0 | 4.0 | 2.0 | 2.0 | 2.0 | - | - |
| Preventive Maintenance and Engineering Changes During Off-prime Hours | 52.2 | 8.7 | - | - | - | - | - | - | - | - |
| Occasional Shift Coverage (Versus Fixed Schedule) | 65.4 | 11.4 | 7.6 | 3.8 | - | - | - | - | - | - |
| Guaranteed Repair Time (Hardware) | 58.7 | 28.3 | 10.9 | 6.6 | 6.6 | 6.6 | 6.6 | 4.4 | 2.2 | 2.2% |
| Guaranteed Turnaround on Software Problems | 25.0 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | - | - |

## D. NEW REVENUE SOURCES FOR FIELD ENGINEERS

- Several new sources of revenues for the field service organization would result from the adoption of the after-sales support concept suggested here for the field service organization.

- An increased role in the sales of hardware and software would not necessarily turn the field engineer into a salesperson; rather an increased effort to make suggestions and even take sales while he is already on-site will emphasize the concept of total customer management.

- From Exhibit VI-4 we see that users are fairly receptive to field service engineers' taking an increased sales role in the area of hardware. This results from users' perceptions of the field engineers' expertise in these areas. Note that users will draw the line between improvements on their existing equipment (e.g., sales of new features, upgrades, and add-on equipment) and sales of new systems.

- An increased involvement in sales by the field service organization will be resisted by the vendors' marketing and sales organizations. Nevertheless because of the field service organization's established contact with users and because of users' trust in the field service organization, the increased sales role by field service should increase total company sales.

## E. CHANGES IN MAINTENANCE CONTRACTS

- Changes in current maintenance contracts are necessary for the following reasons:

EXHIBIT VI-4

USER ATTITUDES TOWARD FIELD SERVICE ENGINEERS
IN SALES ROLES
(percent)

| FIELD ENGINEER'S SALES ACTIVITY | STRONGLY FAVOR | MILDLY FAVOR | NEUTRAL | MILDLY OPPOSE | STRONGLY OPPOSE |
|---|---|---|---|---|---|
| Supplies | 3.9% | 29.7% | 15.0% | 42.5% | 8.8% |
| Hardware Features | 2.6 | 51.3 | 8.2 | 33.0 | 4.9 |
| Add-on Equipment | 2.3 | 51.6 | 6.9 | 34.6 | 4.6 |
| New Models of Equipment | 2.9 | 46.4 | 7.5 | 38.2 | 4.9 |
| Upgrades | 3.6 | 53.6 | 7.2 | 31.4 | 4.2 |
| Software Packages | 2.3 | 37.3 | 25.5 | 31.7 | 3.3 |

= More than 60% of Users in Favor or Neutral

- To cover the extended coverages and alternative offerings suggested by this report (e.g., unbundled maintenance, variable shift coverage).

- To lock in revenues brought in by existing and future contracts (e.g., long-term contracts and automatic renewals).

- Exhibit VI-5 shows users' receptivity to contract provisions suggested by INPUT.

  - Users are extremely interested in unbundled maintenance, which allows them more control over what service they receive.

  - Variable shift coverage also received considerable support.

  - Both automatic renewal and standardized forms received strong yet conditional support. Users desired automatic renewal as long as they had some kind of escape clause, usually with 30-day notice. Standardized forms were also desirable if amendments could be attached when necessary. In both cases, users indicated an awareness of possible cost savings to themselves and to vendors.

- Users are not willing to consider long-term contracts and annual invoicing, perhaps due to shortened life expectancies of the equipment.

EXHIBIT VI-5

CHANGES IN MAINTENANCE CONTRACTS
(percent)

| CONTRACT ADMINISTRATION PROVISION | FAVOR | NEUTRAL | OPPOSE |
|---|---|---|---|
| Long-term Contracts (>1 Year) | 41.2% | 16.0% | 42.8% |
| Automatic Renewal | 52.9 | 13.7 | 33.3 |
| Variable Shift Coverage | 44.1 | 31.4 | 24.5 |
| Standardized Forms (Versus Negotiated Contracts) | 40.8 | 20.9 | 38.2 |
| Annual Invoicing | 34.6 | 18.3 | 47.1 |
| Unbundled Hardware Maintenance | 57.5 | 20.6 | 21.9 |
| Unbundled Software Maintenance | 53.6 | 26.1 | 20.3 |

= Areas where more than 60% of users either favor or are neutral to the contract provision.

# VII LOCAL AREA NETWORK MAINTENANCE ISSUES

# VII LOCAL AREA NETWORK MAINTENANCE ISSUES

## A. INTRODUCTION

- Local Area Networks (LANs) provide a method of transmitting information from one point to another within a limited distance, thus allowing shared resources from desk to desk, office to office, and building to building.

- The dramatic growth of microprocessor technology has spurred the use of LANs in conjunction with current office products such as PBXs, personal computers, and word processors, as shown in Exhibit VII-1. This growth can be attributed to the cost savings of sharing information processing and data storage resources.

- Currently, due to the lack of standardization of LAN architecture and protocol, compatibility of equipment is an important issue.

- In addition, there is a significant lack of coordination in the areas of planning and implementation as a result of the number of user-planned and user-installed systems.

- As use of and reliance on LANs increase, these issues must be addressed by office product vendors.

EXHIBIT VII-1

RELATIVE GROWTH OF SELECTED OFFICE PRODUCTS

| OFFICE PRODUCT | 1980-1985 GROWTH (percent) |
|---|---|
| PBX, PABX | 400% |
| Personal Computer (In Large Corporations) | 600 |
| Word Processors | 400 |

SOURCE: INPUT Estimates

## B. USE OF LOCAL AREA NETWORKS

- The dramatic growth in LANs is readily apparent, as shown in Exhibit VII-1. Users of PBX (PABX) systems, personal computers and word processors were queried concerning their current use of LANs, as shown in Exhibit VII-2.

  - Of all three product types, word processor users use LANs the most (29%). Seventeen percent of the PBX users and 10% of the personal computer users indicated that they use LANs.

  - A surprisingly large number of PBX users did not know if they were currently using a LAN with their system.

## C. CONFIGURATION OF LOCAL AREA NETWORKS

- Users were asked which type of configuration their LAN was. The three commonly used ones are as follows:

  - Star configurations use a central controller connected to each device by cable. The advantage of a star configuration is the simplicity of monitoring and controlling data flow. The disadvantages include high initial cost and the decreased reliability caused by a single point of breakdown. Exhibit VII-3 demonstrates a typical star configuration.

  - A ring configuration connects devices by one or more cables in a ring or circular pattern. Since data can flow either direction in the ring, a breakdown of any single device does not affect the entire network. Exhibit VII-4 depicts a typical ring configuration.

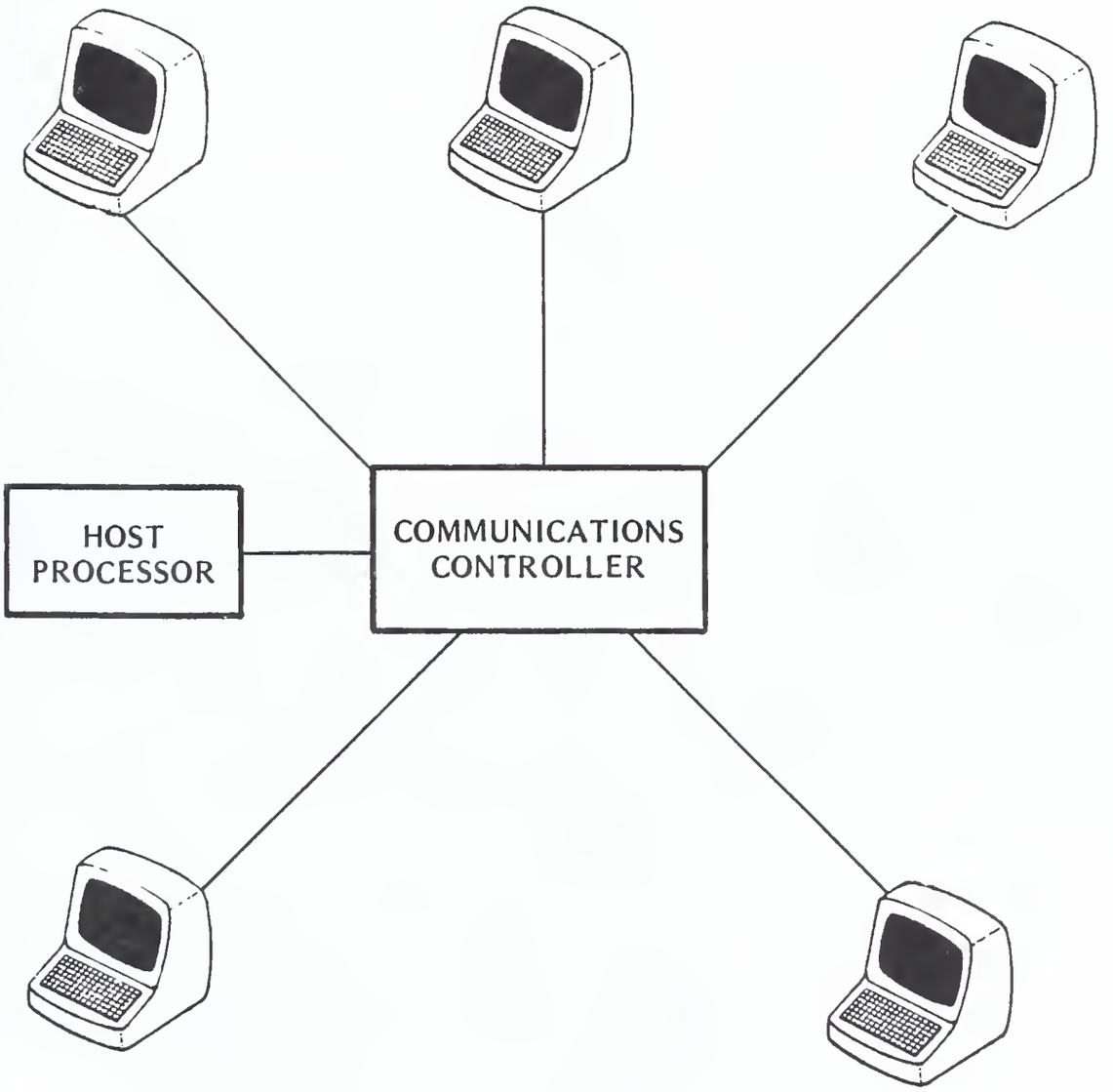
EXHIBIT VII-2

USE OF LOCAL AREA NETWORKS BY PRODUCT

| PRODUCT | DO YOU USE A LOCAL AREA NETWORK? (percent) | | |
|---|---|---|---|
| | YES | NO | N/A |
| All Types | 10.1% | 35.0% | 54.9% |
| PBX, PABX | 17.2 | 31.0 | 51.7 |
| Personal Computer | 9.8 | 85.2 | 4.9 |
| Word Processor | 28.6 | 65.7 | 5.7 |

EXHIBIT VII-3

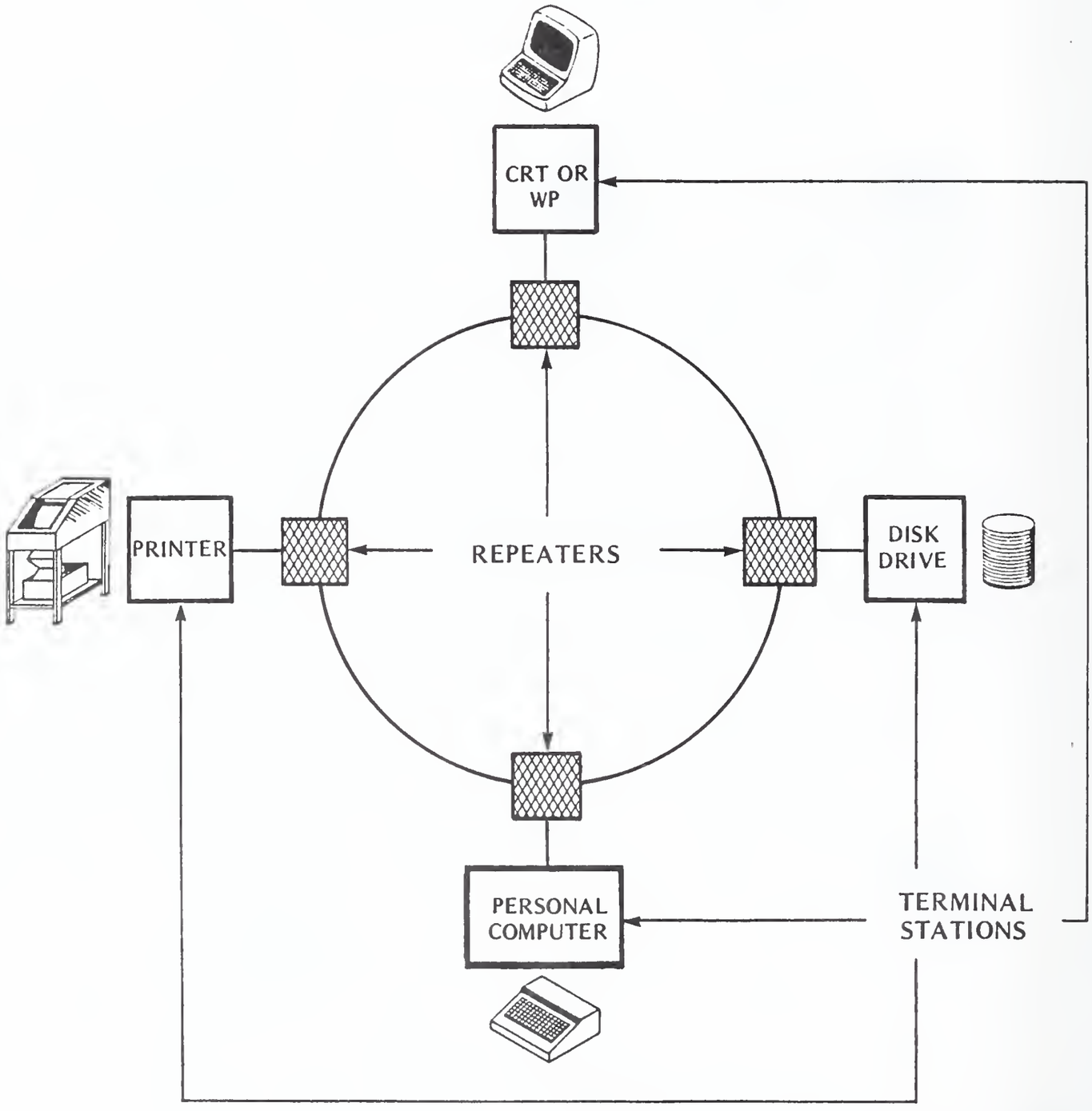
STAR NETWORK CONFIGURATION




= Terminal Stations

EXHIBIT VII-4

RING NETWORK



- A bus configuration is comprised of an open-ended transmission line where devices are connected to the cable by taps, allowing data to also flow both directions from any device. Since the configuration is an open-ended line, it is very easy to add new devices. Also, as in ring-configured networks, a single device failure does not affect other devices in the network. Exhibit VII-5 depicts a typical bus configuration.

- Exhibit VII-6 shows which configurations are used by each product type.

## D. FACTORS IN LOCAL AREA NETWORK MAINTENANCE

- Since users initially turn to networking as a way of increasing resources while reducing overall processing and data storage costs, LAN users will undoubtedly be very price conscious about maintenance.

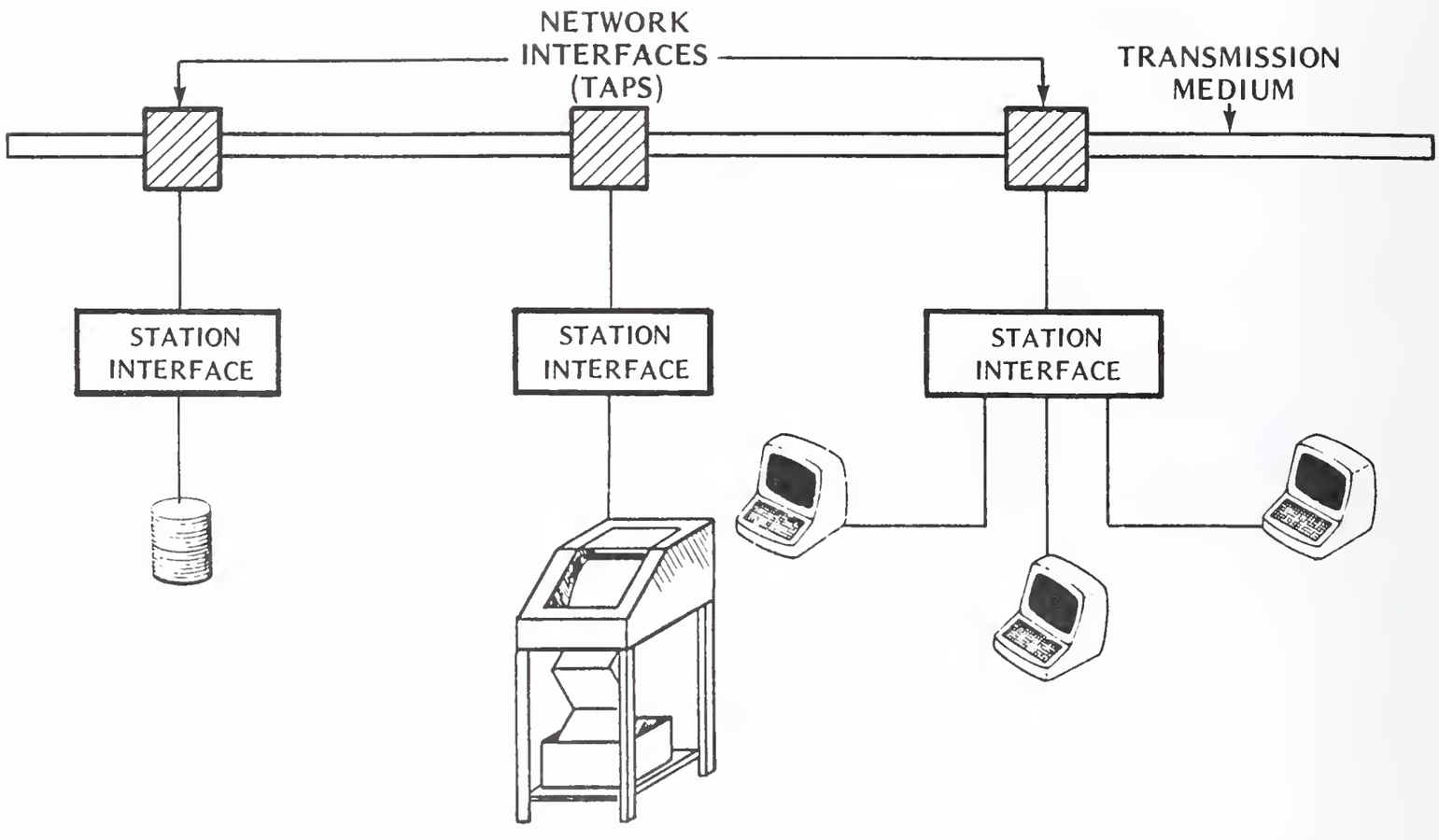
- In addition, LANs will become increasingly integrated into users' information-system structures. This ever-increasing use will cause a burgeoning demand for LAN maintenance. Since users have already expressed a desire for a single source of maintenance, vendors will need to address the issue of providing service on competitive products.

  - The absence of a single source of maintenance has in the past influenced users to provide their own network maintenance. A maintenance management contract would be an ideal solution to this, since vendors would be able to coordinate and control the maintenance of the entire system without additional training of their FEs on competitive products.

  - Another possibility is to combine test equipment with existing computer equipment within the network, which would monitor and diagnose faults within the system.

EXHIBIT VII-5

BUS NETWORK




= Terminal Stations (e.g., CRTs or word processors).

EXHIBIT VII-6

CONFIGURATION OF LOCAL AREA NETWORKS BY PRODUCT

| PRODUCT | CONFIGURATION | | |
|---|---|---|---|
| | STAR | RING | BUS |
| All Types | 81.8% | 14.8% | 3.4% |
| PBX, PABX | 100.0 | - | - |
| Personal Computer | 67.3 | - | 32.7 |
| Word Processor | 76.5 | 23.5 | - |

- Vendors should consider network maintenance a growing market in which many revenue opportunities can be realized.

# VIII STRATEGY RECOMMENDATIONS

# VIII STRATEGY RECOMMENDATIONS

## A. USER REQUIREMENT TRENDS

- As office products become both more complex in design and more integrated into overall information systems structures, users will become more sophisticated. Vendors will have to acknowledge the following trends:

  - Users' increasing awareness of product price decreases and performance increases. Because of them, users will question the validity of maintenance price increases.

  - Users' increasing need for single-source maintenance, especially in connection with local area networks.

  - Users' increasing desire for improved ancillary services such as training and documentation.

- To be successful, vendors will have to take actions in the following areas in order to satisfy both the short-term and long-term needs of their users.

## B. IMMEDIATE USER NEEDS

- At first glance, Exhibit VIII-1 appears to show that, with the exception of personal computer vendors, all vendors have an acceptable overall image to users. It is not until the users respond to specific services that the areas needing immediate improvement surface.

- Foremost is the improvement of maintenance. Over 30% of the overall user sample were dissatisfied with maintenance, both hardware and software. Users say the following improvements are most needed:

  - "Better trained FEs."

  - "More preventive maintenance."

  - "Better overall image, including grooming."

  - "Faster repair time."

  - "Hire more FEs."

  - "Lower costs of maintenance."

- The last comment demonstrates the price consciousness of most users. In order to satisfy this, while still continuing to operate as a profit center, vendors should offer extended services with appropriate premiums and discounted contracts for reduced service levels.

  - Three services most likely to bring in new revenues to the field service organization are guaranteed hardware repair time, guaranteed turnaround on software repairs, and local spare parts inventories. A large number of users felt that local supplies inventories also were a necessity.

EXHIBIT VIII-1

USER RATINGS OF OFFICE PRODUCT VENDORS' OVERALL IMAGE

| PRODUCT | MEAN* | STANDARD DEVIATION | NUMBER OF RESPONSES |
|---|---|---|---|
| All Types | 7.83 | 1.87 | 278 |
| Copiers | 8.25 | 1.38 | 51 |
| Facsimile Machines | 7.65 | 1.99 | 31 |
| PBX, PABX | 8.38 | 1.78 | 29 |
| Personal Computers | 6.51 | 2.45 | 43 |
| Word Processors | 7.86 | 1.97 | 70 |
| Workstations | 8.09 | 1.43 | 54 |

* Rating: 1 = Low, 10 = High

- Users' willingness to work with support centers indicates that vendors will be able to offer discounts to users with the ability to do self-diagnostics and self-maintenance.

- A third area needing attention is the inconsistent implementation of ancillary services, especially documentation and training. Considering the sophistication level of office products users, the extremely high dissatisfaction levels (41% and 28% dissatisfied, respectively) of these services is alarming. Furthermore, since many problems with office products result from misuse, an overall reduction of costs can be achieved by increasing users' knowledge of their equipment.

- Users listed the following improvements copier vendors need to make:

  - "Improve user training."

  - "Provide more preventive maintenance."

  - "Provide faster, better dispatching."

  - "Develop a better attitude."

  - "Improve quality of supplies."

- Facsimile machine users requested the following improvements:

  - "Better image - more professional appearance."

  - "More commitment to FAX support."

  - "Better telephone support."

- "Provide more local spare parts."
- "Improve responsiveness of both sales and service."
- "Design documentation for novices."
- "Better attitude."
- "Improve user training."

- PBX, PABX users suggested the following improvements:
  - "More documentation."
  - "Customer billing."
  - "A user manual. (Never received one - had to write our own.)"
  - "More flexibility with offerings."
  - "Better access to computer."
- Personal computer users required improvements in many areas, including:
  - "Better user training and documentation."
  - "Improved technical support of software."
  - "Support provided by the vendor - not the dealer."
  - "More scheduled preventive maintenance."
  - "Better communications through sales."

- "More follow through on problems."
- "Repairs performed by dealers - not just board swaps."
- "Quicker delivery of updates."

- Users of word processors needed changes in the following areas:
  - "Provide more information on updates."
  - "Provide dedicated field engineers."
  - "Better training."
  - "Improve response time."
  - "Write documentation in layman's terms."
  - "Improve spare parts availability."
  - "More flexibility and compatibility."
  - "Provide preventive maintenance."
  - "Training manuals are terrible."
  - "Improve billing and dispatching."

- Workstation users required the following changes:
  - "Quicker response time."

- "Provide component swap repairs."

- "Improve consulting services."

- "Processing of and renewal of contracts should be easier."

- "Answer sales inquiries faster."

- "Software documentation is poor - consulting service is no help."

- "Maintenance times (shifts) should be specified."

- "Maintenance costs too high - cheaper to replace equipment than to have contractual maintenance."

- "More on-site spares."

## C. RECOMMENDATIONS

- From the previous comments, it becomes clear that the improvements needed cross all product lines. Therefore, the recommendations suggested have been presented for all vendors, regardless of product type.

- The users' suggestions can be broken down into two main groups: those at an operational level, i.e., improved dispatching and invoicing procedures, and those at a customer service level, i.e., improved documentation, training, spares and supplies availability, and preventive maintenance.

  - A solution for the operational problems would be a centralized automated system to handle dispatching, escalation, and invoicing activities. This would reduce paperwork, speed response time, coordinate

scheduling, and facilitate escalation of difficult fault calls. It would also aid in the implementation of historical analysis of fault calls.

- The use of centralized dispatching can also alleviate the customer service problem of parts and supplies allocation, if used in conjunction with real time incident reporting that includes parts usage. This would be a vast improvement over relying on weekly or monthly parts usage reports.

- Another customer service recommendation is the increased scheduling of preventive maintenance. These "good-will" visits provide the user with more than periodic cleaning and repairs; they provide the user a source of communication with the vendor. An additional benefit to the vendor is the added sales opportunity available during PM visits.

- Of critical importance to users is the immediate improvement of documentation and training. The field service organization must assure that the manuals are complete and clearly written at the users' level. At the same time, more emphasis should be placed upon improving users' training techniques. These two steps should improve the users' overall image of the service organization and reduce costs caused by no-fault-found calls, which result from user misuse or misunderstanding.

- A crucial area that vendors will need to address is the development and use of remote diagnostics within office products. Although office product users are less familiar with remote diagnostics than large systems users are, they will increasingly accept it as a maintenance method as they realize improved response times and increased parts accessibility. Vendors can further alleviate user uneasiness with remote diagnostics by maintaining periodic communications with the users.

- Vendors will also need to address the question of how to increase field service revenues while keeping basic maintenance prices down. INPUT recommends

that vendors take a two-pronged approach: offering variable levels of services with appropriate premiums and discounts, and extending the service activities into new areas of support such as sales support. Specific suggestions include:

- Guaranteed hardware and software repair times (where applicable) with appropriate premiums.

- Local spare parts and supplies inventories with appropriate premiums.

- Discounts for working with telephone support centers.

- Another ripe source of revenues is sales support. We have found that users are not only receptive to the field service representative's acting in a sales role, but even request (and in some cases expect) their support.

- Yet another source of revenues for office products vendors stems from the need for complete service of local area networks. In order to draw revenues from this quickly developing market, vendors will have to initiate policy decisions that will provide a single source of maintenance for all parts of LANs. Although vendors could attempt to provide maintenance on competitive products, the problems of time and expense incurred during training, and the determination of responsibility during service-related problems, would not make this option feasible. Instead, the implementation of a maintenance management contract would provide users a single source while freeing the vendor from training their FEs on competitive products.

- Finally, vendors should reevaluate their methods of determining the needs of their customers in order to improve satisfaction rates in both hardware and software support. Acting on previously listed recommendations will increase user satisfaction, yet service organizations will also need to provide more consistency in the quality of their service. After all, users still base a major part of their decision upon the quality of service that they feel they receive,

as shown in Exhibit VIII-2. In order to bring about more consistent service, vendors should improve the training of field engineers, especially in software service.

## D. CONCLUSIONS

- According to recent INPUT industry surveys, over 90% of field service organizations are now measured as profit centers (a gain of 30% over the past five years). This clearly indicates a trend away from a cost center image and demonstrates a need for new sources of revenues.

- In order to accomplish these things, vendors will look for new ways to satisfy their existing customer base while attracting new customers. The adoption of an after-sales support role for the field service organization will enable vendors to provide the services and support that users are looking for.

EXHIBIT VIII-2

IMPORTANCE OF VENDOR REPUTATION, EQUIPMENT RELIABILITY, AND PROMPT REPAIRS AS FACTORS IN SELECTING VENDORS

| PRODUCT | FACTOR* | | | NUMBER OF RESPONSES |
|---|---|---|---|---|
| | Vendor Reputation | Equipment Reliability | Ability to Repair Quickly | |
| All Types | 8.35 | 9.20 | 8.96 | 292 |
| Copiers | 8.20 | 9.00 | 8.96 | 51 |
| Facsimile Machines | 8.72 | 9.59 | 9.25 | 32 |
| PBX, PABX | 9.10 | 9.69 | 9.69 | 29 |
| Personal Computers | 8.28 | 8.84 | 8.39 | 57 |
| Word Processors | 8.11 | 9.42 | 9.27 | 66 |
| Workstations | 8.12 | 8.84 | 8.55 | 57 |

* RATING: 1 = Low, 10 = High

# APPENDIX A: QUESTIONNAIRE

| VENDOR* | PRODUCT* | | | | | |
|---|---|---|---|---|---|---|
| | Word Processors | Copiers | Personal Computers | Work Stations | PBX, PABX | Facsimile Machines |
| 3M | | | | | | |
| 3 Rivers | | | | | | |
| Apollo | | | | | | |
| Apple | | | | | | |
| ATT | | | | | | |
| Burroughs | | | | | | |
| Convergent Technologies | | | | | | |
| CPT | | | | | | |
| DEC | | | | | | |
| Exxon | | | | | | |
| GTE | | | | | | |
| Hewlett-Packard | | | | | | |
| Honeywell | | | | | | |
| IBM | | | | | | |
| ITT Courier | | | | | | |
| Kodak | | | | | | |
| NBI | | | | | | |
| Northern Telecom | | | | | | |
| Wang | | | | | | |
| Xerox | | | | | | |

1. On a scale of 1-10, please rate _____(vendor) in the following categories:

| | (1-10) |
|---|---|
| a) Service management communication | _____ (A1) |
| b) Hardware service engineer's communication | _____ (A2) |
| c) Software service engineer's communication | _____ (A3) |
| d) Ability to diagnose problems in hardware and to make quality repairs | _____ (A4) |
| e) Ability to maintain software | _____ (A5) |
| f) General responsiveness of the vendor organization | _____ (A6) |
| g) Overall service image | _____ (A7) |
| h) Taking the initiative to improve user operations | _____ (A8) |
| i) Resolution of invoicing disputes | _____ (A9) |
| j) Dispatching trouble calls | _____ (A10) |
| k) Escalation of extended downtime | _____ (A11) |

Comments: _____

_____

_____

_____

_____

2. How long does it normally require _____ to repair your equipment? _____ hours (R/A fill in vendor name.)
(R1)

3. What is your requirement for hardware service response time?
_____ hours.
(R2)

4. What is the average time it takes _____ to vendor.) respond? _____ hours (R/A fill in vendor).
(R3)

5. Research Analyst, ask this question only to users of word processors, personal computers, or PBX.

A. Do you use a local area network? ☐ Yes ☐ No

B. If yes, check one in each column below to describe the configuration:

| | |
|---|---|
| 1. STAR _____ | 4. Twisted Pair _____ |
| 2. RING _____ | 5. Baseband _____ |
| 3. BUS _____ | 6. Broadband _____ |

6. a) What overall level of availability do you require of your equipment? (Availability is defined as the ratio of scheduled usage divided by the sum of scheduled time plus downtime plus recovery time.) _____%
(R10)

b) What level availability are you experiencing? _____
(R11)

7. What level of availability do you require of your equipment during your most critical periods? _____%
(R12)

8. When you select one equipment vendor or maintenance vendor over the others, how important are the following criteria? Please rate on a scale of 1-10.

| Selection Criteria | (1-10) Weight (Rate) |
|---|---|
| a) Vendor reputation | _____ (A104) |
| b) Equipment reliability | _____ (A105) |
| c) Ability of vendor to repair troubles quickly | _____ (A106) |
| d) Price of equipment | _____ (A107) |
| e) Price of maintenance | _____ (A108) |

9. On a scale of 1-10, how important is a single source of maintenance to you? (1 = no importance, 5 = worth serious consideration, 10 = absolutely necessary) _____ (A51)

10. Do you employ third-party maintenance for any of your equipment? Yes/No _____ (C1)

11. Have you considered third-party maintenance as a single source? Yes/No _____ (C2)

12. Would you consider a maintenance management contract as an alternative to a single source or third-party? The management contract would provide you with a single interface to all vendors. Yes/No _____ (C3)

* DATA ENTRY: Questions 10-12 are single character entries, either "Y", "N", or nothing.

13. Do you have a requirement for any of the following services, and if so, what would you consider a reasonable premium to pay over the basic maintenance charge?

| Service | *Yes/No | Reasonable Premium (percent) |
|---|---|---|
| a) On-site maintenance | (C14) | (A101) |
| b) Guaranteed uptime | (C5) | (A53) |
| c) Guaranteed response time | (C6) | (A54) |
| d) Local supplies inventories | (C15) | (A102) |
| e) Local spare parts inventories | (C16) | (A103) |
| f) Preventive maintenance and field changes during off-prime hours | (C9) | (A57) |
| g) Occasional shift coverage (versus fixed schedule) | (C10) | (A58) |
| h) Guaranteed repair time (hardware) | (C12) | (A60) |
| i) Guaranteed turnaround on software fixes when applicable. | (C13) | (A61) |

* DATA ENTRY: For "Yes/No" column see note on preceeding page.

14. a) Please rate, on a scale of 1-10, your requirements for the following vendor goods and services.

b) Please rate your current level of satisfaction with the goods and services you receive from your equipment and/or maintenance vendor.

| Vendor Goods and Services | Scale 1-10 | |
|---|---|---|
| | Requirement (a) | Current Level (b) |
| Environmental Planning | (A62) | (A63) |
| Physical Site Planning | (A64) | (A65) |
| Consulting | (A66) | (A67) |
| Documentation | (A68) | (A69) |
| Training | (A70) | (A71) |
| Installation Planning | (A72) | (A73) |
| Hardware Maintenance | (A74) | (A75) |
| Software Maintenance | (A76) | (A77) |
| Supplies Sales | (A78) | (A79) |
| Add-on Sales | (A80) | (A81) |
| Site Audits | (A82) | (A83) |
| Relocation | (A84) | (A85) |
| De-installation | (A86) | (A87) |

15) Would you favor or oppose having the field service engineer in a sales role for the following:

| | Favor | | Neutral | Oppose | |
|---|---|---|---|---|---|
| | Strongly | Mildly | | Mildly | Strongly |
| Supplies | (B1) | (B2) | (B3) | (B4) | (B5) |
| Hardware features | (B6) | (B7) | (B8) | (B9) | (B10) |
| Add-on equipment | (B11) | (B12) | (B13) | (B14) | (B15) |
| New models of equipment | (B16) | (B17) | (B18) | (B19) | (B20) |
| Upgrades | (B21) | (B22) | (B23) | (B24) | (B25) |
| Software packages | (B26) | (B27) | (B28) | (B29) | (B30) |

16. Regarding your maintenance contracts, which of the following provisions do you favor or oppose?

| | Favor | Neutral | Oppose |
|---|---|---|---|
| Long-term contracts > 1 year | (B31) | (B32) | (B33) |
| Automatic renewal | (B34) | (B35) | (B36) |
| Variable shift coverage | (B37) | (B38) | (B39) |
| Standardized forms (versus negotiated contracts) | (B40) | (B41) | (B42) |
| Annual invoicing | (B43) | (B44) | (B45) |

17. Assuming appropriate discounts or premiums as applicable, please rate the relative importance of receiving your hardware and software maintenance by the following methods: (scale 1-10)

| | (1-10) | |
|---|---|---|
| | Hardware | Software |
| Traditional, on-site response to trouble calls | _____ (A89) | _____ (A90) |
| Your involvement in diagnosis working with support center | _____ (A91) | _____ (A92) |
| Your involvement replacing circuit boards, other components, or patching software | _____ (A95) | _____ (A96) |
| Delivering portable modules to repair centers | _____ (A97) | _____ (A98) |
| On-site stand-by of service personnel during critical periods. | _____ (A99) | _____ (A100) |

18. Do you favor or oppose the unbundling of maintenance requirements?

| | Favor | Neutral | Oppose |
|---|---|---|---|
| Hardware | _____ (B46) | _____ (B47) | _____ (B48) |
| Software | _____ (B49) | _____ (B50) | _____ (B51) |

19. In your opinion, what changes should _____ (vendor) make to significantly improve the level of service?

_____

_____

_____

_____

_____

_____

20. Are the improvements needed generally throughout field service or just at _____(vendor)?

Comments: _____

_____

_____

_____

_____

_____

# APPENDIX B: DATA BASE FORMAT

## APPENDIX B: DATA BASE FORMAT

### A. DATA BASE OVERVIEW

- The user requirements data base is held at INPUT on Apple computers using the CP/M operating system.

- Data entry was accomplished using Ashton-Tate's dBASE II relational data base management system. The same system was used to create the raw data printouts already delivered.

- The data base for office product users is contained in three raw data files and one numeric file created from quantifiable raw text data.

  - FOP1A - 60K.

  - FOP1B - 44K.

  - FOP1C - 36K.

  - FOP1D - 20K.

## B. DESCRIPTION OF FILES

- Exhibits B-1 through B-4 list the field names and structures of the four files as originally created under dBASE II.

  - These field names and parameters are contained in the four dBASE II structure files (FOP1A.DBF, FOP1B.DBF, etc.).

  - Fields are easily recognizable by the corresponding question numbers and/or data cell descriptors in the questionnaire reproduced in Appendix A.

  - The listings contain additional information about the data type, maximum allowable characters in the field, and the number of decimal positions.

    - For example, in Exhibit B-1, the "Q2" field (number 18) is type "N" (numeric), and 7 characters wide (6 numerals and a decimal point), and contains 2 deciman positions.

    - A second example in Exhibit B-1 is the field "VENDOR" which contains alphanumeric characters (C) and has a maximum capacity of 20 characters (20).

- FOP1A is a raw data file containing demographic data (some of which has been removed to protect the users), vendor, product, and responses to questions 1 through 7.

- FOP1B is a raw data file containing responses to questions 8 through 13 and question 17. Raw data is contained in this file in the form of text for yes and no answers to certain questions; these text data are transformed later into numerical equivalents in FOP1D.

EXHIBIT B-1

OPA, DBF

| FIELD | NAME | TYPE | WIDTH | DEC |
|---|---|---|---|---|
| 001 | CAT:NO | N | 005 | 001 |
| 002 | ZIP | C | 005 | |
| 003 | INDUSTRY | C | 030 | |
| 004 | AREA | C | 003 | |
| 005 | VENDOR | C | 020 | |
| 006 | PRODUCT | C | 020 | |
| 007 | Q1:A | N | 002 | |
| 008 | Q1:B | N | 002 | |
| 009 | Q1:C | N | 002 | |
| 010 | Q1:D | N | 002 | |
| 011 | Q1:E | N | 002 | |
| 012 | Q1:F | N | 002 | |
| 013 | Q1:G | N | 002 | |
| 014 | Q1:H | N | 002 | |
| 015 | Q1:I | N | 002 | |
| 016 | Q1:J | N | 002 | |
| 017 | Q1:K | N | 002 | |
| 018 | Q2 | N | 007 | 002 |
| 019 | Q3 | N | 007 | 002 |
| 020 | Q4 | N | 007 | 002 |
| 021 | Q5:A | N | 003 | |
| 022 | Q5:B:123 | N | 002 | |
| 023 | Q5:B:456 | N | 002 | |
| 024 | Q6:A | N | 006 | 002 |
| 025 | Q6:B | N | 006 | 002 |
| 026 | Q7 | N | 006 | 002 |

EXHIBIT B-2

OPB, DBF

| FIELD | NAME | TYPE | WIDTH | DEC |
|---|---|---|---|---|
| 001 | CAT:NO | N | 005 | 001 |
| 002 | Q8:A | N | 002 | |
| 003 | Q8:B | N | 002 | |
| 004 | Q8:C | N | 002 | |
| 005 | Q8:D | N | 002 | |
| 006 | Q8:E | N | 002 | |
| 007 | Q9 | N | 003 | |
| 008 | Q10:Q12 | C | 009 | |
| 009 | Q13:Y:N | C | 034 | |
| 010 | Q13:A | N | 004 | 001 |
| 011 | Q13:B | N | 004 | 001 |
| 012 | Q13:C | N | 004 | 001 |
| 013 | Q13:D | N | 004 | 001 |
| 014 | Q13:E | N | 004 | 001 |
| 015 | Q13:F | N | 004 | 001 |
| 016 | Q13:G | N | 004 | 001 |
| 017 | Q13:H | N | 004 | 001 |
| 018 | Q13:I | N | 004 | 001 |
| 019 | Q17:A89 | N | 002 | |
| 020 | Q17:A90 | N | 002 | |
| 021 | Q17:A91 | N | 002 | |
| 022 | Q17:A92 | N | 002 | |
| 023 | Q17:A95 | N | 002 | |
| 024 | Q17:A96 | N | 002 | |
| 025 | Q17:A97 | N | 002 | |
| 026 | Q17:A98 | N | 002 | |
| 027 | Q17:A99 | N | 002 | |
| 028 | Q17:A100 | N | 002 | |
| 029 | PRODUCT | C | 020 | |

EXHIBIT B-3

OPC, DBF

| FIELD | NAME | TYPE | WIDTH | DEC |
|---|---|---|---|---|
| 001 | CAT:NO | N | 005 | 001 |
| 002 | Q14:A62 | N | 002 | |
| 003 | Q14:A63 | N | 002 | |
| 004 | Q14:A64 | N | 002 | |
| 005 | Q14:A65 | N | 002 | |
| 006 | Q14:A66 | N | 002 | |
| 007 | Q14:A67 | N | 002 | |
| 008 | Q14:A68 | N | 002 | |
| 009 | Q14:A69 | N | 002 | |
| 010 | Q14:A70 | N | 002 | |
| 011 | Q14:A71 | N | 002 | |
| 012 | Q14:A72 | N | 002 | |
| 013 | Q14:A73 | N | 002 | |
| 014 | Q14:A74 | N | 002 | |
| 015 | Q14:A75 | N | 002 | |
| 016 | Q14:A76 | N | 002 | |
| 017 | Q14:A77 | N | 002 | |
| 018 | Q14:A78 | N | 002 | |
| 019 | Q14:A79 | N | 002 | |
| 020 | Q14:A80 | N | 002 | |
| 021 | Q14:A81 | N | 002 | |
| 022 | Q14:A82 | N | 002 | |
| 023 | Q14:A83 | N | 002 | |
| 024 | Q14:A84 | N | 002 | |
| 025 | Q14:A85 | N | 002 | |
| 026 | Q14:A86 | N | 002 | |
| 027 | Q14:A87 | N | 002 | |
| 028 | Q15 | C | 018 | |
| 029 | Q16 | C | 015 | |
| 030 | Q18 | C | 006 | |
| 031 | PRODUCT | C | 020 | |

EXHIBIT B-4

OPD, DBF

| FIELD | NAME | TYPE | WIDTH | DEC |
|---|---|---|---|---|
| 001 | CAT:NO | N | 005 | 001 |
| 002 | Q8:A | N | 002 | |
| 003 | Q8:B | N | 002 | |
| 004 | Q8:C | N | 002 | |
| 005 | Q8:D | N | 002 | |
| 006 | Q8:E | N | 002 | |
| 007 | Q9 | N | 003 | |
| 008 | Q10:Q12 | C | 009 | |
| 009 | Q13:Y:N | C | 034 | |
| 010 | Q13:A | N | 004 | |
| 011 | Q13:B | N | 004 | |
| 012 | Q13:C | N | 004 | |
| 013 | Q13:D | N | 004 | |
| 014 | Q13:E | N | 004 | |
| 015 | Q13:F | N | 004 | |
| 016 | Q13:G | N | 004 | |
| 017 | Q13:H | N | 004 | |
| 018 | Q13:I | N | 004 | |
| 019 | Q17:A89 | N | 002 | |
| 020 | Q17:A90 | N | 002 | |
| 021 | Q17:A91 | N | 002 | |
| 022 | Q17:A92 | N | 002 | |
| 023 | Q17:A95 | N | 002 | |
| 024 | Q17:A96 | N | 002 | |
| 025 | Q17:A97 | N | 002 | |
| 026 | Q17:A98 | N | 002 | |
| 027 | Q17:A99 | N | 002 | |
| 028 | Q17:A100 | N | 002 | |
| 029 | PRODUCT | C | 020 | |

- FOP1C is a raw data file containing responses to questions 14, 15, and 18. As in FOP1B above, certain text data will be transformed into numerical equivalents in FOP1D as discussed below.

- FOP1D is a file created from certain raw text data in FOP1B and FOP1C substituting numerical ranges for responses:

  - Yes/no responses (C1-C13) are translated as follows:

    . No = -1
    . Yes = +1
    . No answer = 0

  - The text responses (check marks) to B1-B30 found in FOP1C become numeric data in FOP1D found in the related fields named B1, B6, . . ., B26 with the following translation:

    . Favor strongly = +2
    . Favor mildly = +1
    . Neutral = 0
    . Oppose mildly = -1
    . Oppose strongly = -2

  - Similarly, the text responses from FOP1C in B31-B51 become numeric data in FOP1D field B31, B34, . . ., B49 with three levels of translation:

    . Favor = +1
    . Neutral = 0
    . Oppose = -1

- Linkage of the files is accomplished with the questionnaire catalog number (CAT:NO) field which is common in all four files for each respondent to the questionnaire.

- Gaps in catalog number sequence are normal; the files have been completely edited for linkage consistency.

- The "CAT:NO" field contains one decimal position to allow the insertion of late responses into the proper sequence.

- The requirement of multiple files was imposed by constraints in dBASE II and the desirability of restoring the files to a popular CP/M-based data base management system.

# APPENDIX C: OFFICE PRODUCTS USERS INTERVIEWED

## APPENDIX C: OFFICE PRODUCTS USERS INTERVIEWED

- A & B TRANSPORTATION
- AAA
- ABBOTT LABORATORIES
- AEROSPACE CORPORATION
- AGBOBIAN ASSOCIATES
- AIFP TRADING GROUP
- AIR FRAM MANUFACTURING
- ALBERTSONS
- ALLAN HANCOCK COLLEGE
- ALLEN BRADLEY
- ALUMAX INC.
- AMERICAN EDWARDS LABORATORIES
- AMERICAN PRODUCTIVITY CENTER
- AMERICAN RED CROSS
- AMERICAN SECURITY BANK
- AMTEC INDUSTRIES
- ANDERSON CLAYTON COMPANY
- ANGLO AMERICAN AVIATION CORPORATION
- ANHEUSER-BUSCH COMPANYIES
- ARCATA COMPANY
- ARIZONA CRIMINAL INTELLIGENCE
- ARMORLITE LENS COMPANY
- ARMSTRONG NURSERIES
- ASSOCIATED GROCERS

- ATHENS COLLEGE
- AVERY INTERNATIONAL
- BAKIN 5 CORPORATION
- BANCWEST MORTGAGE
- BANK OF NEWPORT
- BANKERS LIFE & CASUALTY COMPANY
- BASHAS MARKETS
- BAY AREA AIR QUALITY MANAGEMENT
- BEAR CREEK CORPORATION
- BEDELL & NELSON INSURANCE
- BELDON CORPORATION
- BENEFICIAL CORPORATION
- BERGEN BRUNSWIG DATA
- BEVERAGE DISTILLERS CORPORATION
- BLUE CROSS OF ARIZONA
- BOOKKEEPERS BUSINESS SERVICES
- BORDEN INC.
- BORG WARNER
- BROWN TRANSPORT
- BRUNSWICK
- BUILDER'S SUPPLY
- CALIFORNIA DEPARTMENT WATER RESOURCES
- CALIFORNIA INSTITUTE OF TECHNOLOGY
- CALIFORNIA STATE COMPENSATION INSURANCE
- CALIFORNIA ALMOND GROWERS EXCHANGE
- CARE CORPORATION
- CARNATION COMPANY
- CASTANEDA BUSINESS SERVICES
- CATALYTIC INC.
- CCI CORPORATION
- CENTRAL BANK OF DENVER
- CHARLES FORD DEPARTMENT STORE
- CHARTER MEDICAL CORPORATION

- CHEMSOLVE
- CHILDREN'S HOME SOCIETY OF CALIFORNIA
- CIPHER DATA PRODUCTS
- CITIZENS SECURITY
- CITY OF BLOOMINGTON
- CITY OF COLLINSVILLE
- CITY OF DAYTONA BEACH
- CITY OF GOLDEN
- CITY OF SANTA CRUZ
- CITY OF SEATTLE
- CITY OF SIMI VALLEY
- CITY OF SIMI VALLEY POLICE DEPARTMENT
- COFFINBERRY, STALLINGS
- COLLEGE OF THE REDWOODS
- COLORADO DEPARTMENT OF INSTRUCTION
- COLORADO SCHOOL OF MINES
- COMMONWEALTH THEATRES INC.
- COMPUTER SOLUTIONS INC.
- COMPUWORD
- CONOCO INC.
- COPY MART
- CORPORATE SYSTEMS
- COTTON STATES MUTUAL INSURANCE
- CRAFLITE
- CRANMER ENGINEERING
- CRANTON BROTHERS
- CW BEANE
- DELTA AIRLINES
- DEPARTMENT OF FINANCE & REVENUE
- DERRY TOWNSHIP
- DESIGN SPACE INTERNATIONAL
- DINERS CLUB
- DOME PETROLEUM

- DON SWANSON INSURANCE
- DR. GEORGE WEINBERGER
- EASTERN WASHINGTON UNIVERSITY
- EBSCO INDUSTRIES
- EDWARDS & KELCEY
- EMMCO INSURANCE COMPANY
- EMPIRE MACHINE COMPANY
- EMPLOYEE BENEFITS
- EQUITABLE LIFE OF IOWA
- EVERETT GRIFFITH & ASSOCIATES
- EVERITT COMPANIES
- EXCHANGE MUTUAL INSURANCE
- EXXON NUCLEAR COMPANY
- F. D. TITUS
- FAIRVIEW HOSPITAL
- FARM BUREAU INSURANCE
- FBI
- FEDERAL EXPRESS CORPORATION
- FIRST COMMODITY GROUP
- FIRST NATIONAL
- FRANCO MANUFACTURING COMPANY INC.
- FREMONT MEDICAL CENTER
- FRUEHAUF CORPORATION
- GATX
- GATX LEASING CORPORATION
- GENERAL INSURANCE COMPANY
- GILMAN ENGINEERING
- GONTANG & ASSOCIATES
- GRAPHICS EMPORIUM
- GREAT OAK INSURANCE COMPANY
- GREAT SOUTHERN LIFE INSURANCE
- GROWMARK INC.
- GUARANTY NATIONAL INSURANCE COMPANY

- H. A. LOTT
- HARRIS TRUST & SAVINGS
- HARTFORD HOSPITAL
- HAYST ASSOCIATES
- HEALTH EXAMINERS
- HEART FEDERAL SAVINGS
- HILLSIDE HOSPITAL
- HOLLYTEX CARPET MILLS
- HOUSEHOLD FINANCE
- HYGENICS INC.
- IMED CORPORATION
- INNOSYS INC.
- INPUT
- INTERNATIONAL IMPORTERS
- IRECO CHEMICALS
- J. R. SIMPLOT COMPANY
- J. G. BOSWELL COMPANY
- JEFFERSON COUNTY
- JEWELL COMPANIES
- JOB SERVICE OF NORTH DAKOTA
- JOHN DEERE & COMPANY
- JTS COMPUTER SERVICES
- KANSAS CITY LIFE INSURANCE
- LEWIS & ROCA
- LIFE INSURANCE COMPANY OF GEORGIA
- LITTON BISNETICS
- LONEJOY
- LUBRIZOL CORPORATION
- LUMBERMANS MUTUAL CASUALTY
- MACRO SYSTEMS INC.
- MARINE SURVEYER
- MBPXL
- METROPOLITAN EDISON

- MICHAEL KINGSBURY
- MID CONTINENT COMPUTER SERVICES
- MINERVA BOOKS
- MISSION INSURANCE COMPANY
- MISSISSIPPI CHEMICAL COMPANY
- MITSUBISHI BANK OF CALIFORNIA
- MORTGAGE GUARANTEE INSURANCE
- MOUNTAIN FUEL SUPPLY
- MUTUAL BENEFIT LIFE INSURANCE
- MUTUAL SERVICE INSURANCE COMPANY
- MYRIAD DATA SYSTEMS
- NELSON GUSTIN & BRANDLIN
- NEW ALBANY
- NORDSTROM
- NORTHSTAR MUTUAL INSURANCE
- O'DAY CONSULTANTS
- OAK INDUSTRIES INC.
- OCEANIC ENTERPRISES INC.
- OKLAHOMA EMPLOYMENT COMMISSION
- OLD NATIONAL BANK
- OPTICAL COATING LABORATORY
- OREGON BANK
- OREGON PHYSICIAN'S SERVICE
- OSBORNE/McGRAW HILL
- PACE INDUSTRIES
- PACIFIC LIGHTING CORPORATION
- PAOLI & PAOLI INC.
- PAOLUCCIO WILLIS & NAW ASSOCIATES
- PEOPLES BANK OF TRUST
- PEPSI COLA ALLIED BEVERAGE CORPORATION
- PHIL TWEEDZ
- PHOENIX NATIONAL TITLE
- PLAYBOY ENTERPRISES

- PORTLAND STATE UNIVERSITY
- PRODUCERS COTTON OIL COMPANY
- PULLMAN INC.
- RANDOM HOUSE INC.
- RAYCHEM CORPORATION
- REDWING CARRIERS
- REIFER CONSULTANTS
- ROPE & WILLIAMSON
- S. F. CITY & COUNTY FIRE DEPARTMENT
- SAFETRAN SYSTEM CORPORATION
- SAMS TECHNICAL SERVICES
- SAN DIEGO TRUST BANK
- SEAFIRST COMPUTER SERVICES
- SECURITY LIFE OF DENVER
- SECURITY PACIFIC CORPORATION
- SEDCO
- SENTRY INSURANCE
- SERVICE DATA PROCESSING
- SHARON STEEL CORPORATION
- SHASTA BEVERAGE COMPANY
- SMITH INTERNATIONAL
- SNAP-ON TOOLS CORPORATION
- SOALIAR COMPANY
- SOLINET
- SONS OF NORWAY
- SOUTHEASTERN AVIATION
- SPENCER FOODS
- SPERRY UNIVAC
- SPRINGS INDUSTRIES
- SSR CORPORATION
- ST. JOSEPHS HOSPITAL
- STANDEN COMPANY
- SULPHUR SPRINGS VALLEY ELECTRIC

- SUPER VALUE STORES
- SUPERMARKETS GENERAL CORPORATION
- TEKTRONIX
- TEXACO CHEMICAL
- THE ANDERSONS
- THE HOUSTONIAN
- THOMAS RICHARDSON
- THOUGHTWARE PUBLISHING INC.
- TIPTON & HURST INC.
- TOYOTA MOTOR SALES
- TRANSPORTATION MANAGEMENT SYSTEMS
- TRW
- TWIN CITY BOTTLE, INC.
- TYSON FOODS
- U. C. HIL CONSULTING
- U. S. BANCORP
- U. S. DEPARTMENT OF COMMERCE
- U. S. DEPARTMENT OF HEW
- U. S. FLEET NUMERICAL WEATHER
- UNION SAFE DEPOSIT BANK
- UNITED BANK SERVICE COMPANY
- UNITED SILVER & CUTLERY
- USDA NATIONAL FINANCE CENTER
- UTAH TRANSIT AUTHORITY
- VARIAN ASSOCIATES
- VILLAGE OF NILES
- W. A. WILDE COMPANY
- WALT DISNEY PRODUCTIONS
- WASHINGTON COUNTY HOSPITAL
- WASHINGTON MUTUAL SAVINGS BANK
- WEBER COUNTY
- WILLIAM COOK COMPANY ACCOUNTANTS
- WINNEBAGO COUNTY

- WOODBURY & LATHRAP
- WORCHESTER FOUNDATION
- YELLOW FREIGHT SYSTEM
- YOLA COUNTY